UNLIMITED

ARROW I- FLIGHT TESTS

FILE IN VAULT

AVRO AIRCRAFT LIMITED

INTER DEPARTMENTAL MEMORANDUM

UNLIMITED

Ref: 8241/01/J
Date: 17th April, 1958
From: C.V. Lindow
To: Distribution as below

Attached hereto please receive a copy of Amendment No. 5 to "Design Certificate for Flight Trials of Arrow 1 Aircraft Serial No. 25201" Report No. 71/PROJ 7/1.

C.V. Lindow
Engineering Project Manager
Arrow

Messrs.	J.L. Plant	Copy No. 1
	J.C. Floyd	2
	W/C G.B. Waterman	3-6
	R.N. Lindley	7
	J.A. Morley	8
	J.A. Chamberlin	9
	S.E. Harper	10
	J. Zurakowski	11
	D. Rogers	12
	G. Hake	13,14
	F.P. Mitchell	15
	F. Brame	16
	J.W. Ames	17
	J.P. Booth	18
	J.H. Millie	19
	H. Beffort	20
	C. Meilton	21
	R. Hopper	22
	V.J. Hatton	23
	R. Gilbertson	24
	D. Riggs	25
	D. Scard	26

UNCLASSIFIED
Classification cancelled/changed to .....
by authority of ..... (date)
Signature ..... Rank .....

Report No. 71/PROJ 7/1

AVRO AIRCRAFT LIMITED

AMENDMENT NO. 5

TO

DESIGN CERTIFICATE

FOR FLIGHT TRIALS OF ARROW 1 AIRCRAFT

SERIAL NO. 25201

The following forms a part of, and shall be read in conjunction with, the Design Certificate for Flight Trials of Arrow 1 Aircraft Serial No. 25201, dated 20th February 1958.

SECTION B - SPECIAL LIMITATIONS FOR ARROW FLIGHT TRIALS

Delete 1.1 (from Amendment 3)	The horizontal center of gravity in flight must not exceed an aft limit of 30.00% MAC, (Gear up).
NOTE:	The c.g. limits now revert to the Model Specification limitations of 28% MAC Forward to 31% MAC Aft, Gear up or Gear down.

DATED 4th April 1958 SIGNED [signature]

AVRO AIRCRAFT LIMITED

INTER-DEPARTMENTAL MEMORANDUM

Ref: 7441/01/J
Date: 21st March, 1958
From: F.P. Mitchell, C.V. Lindow
To: Distribution as below

Attached hereto please receive a copy of Amendment No. 2 to "Design Certificate for Flight Trials of Arrow 1 Aircraft Serial No. 25201" Report No. 71/PROJ 7/1.

F.P. Mitchell
Project Designer - Arrow 1

C.V. Lindow
Engineering Project Manager
Arrow

Messrs.	J.L. Plant	Copy No. 1
	J.C. Floyd	2
	W/C G.B. Waterman	3-6
	R.N. Lindley	7
	J.A. Morley	8
	J.A. Chamberlin	9
	S.E. Harper	10
	J. Zurakowski	11
	D. Rogers	12
	G. Hake	13,14
	C.V. Lindow	15
	F. Brame	16
	J.W. Ames	17
	J.P. Booth	18
	J.H. Millie	19
	H. Beffort	20
	C. Meilton	21
	R. Hopper	22
	V.J. Hatton	23
	R. Gilbertson	24
	D. Riggs	25
	D. Scard	26

Report No. 71/PROJ 7/1

AVRO AIRCRAFT LIMITED

AMENDMENT NO. 2

TO

DESIGN CERTIFICATE

FOR FLIGHT TRIALS OF ARROW 1 AIRCRAFT

SERIAL NO. 25201

The following forms a part of, and shall be read in conjunction with, the Design Certificate for Flight Trials of Arrow 1 Aircraft Serial No. 25201, dated 20th February 1958.

SECTION B - SPECIAL LIMITATIONS FOR ARROW FLIGHT TRIALS

Delete	1.1	The horizontal center of gravity in flight must be between 28.75% MAC and 29.25% MAC.
Add	1.1	The horizontal center of gravity in flight must be between 27.75% MAC and 28.15% MAC.
Delete (from Amendment 1)	2.1	The aircraft is limited to speeds not exceeding 350 knots EAS.
Add	2.1	The aircraft is limited to speeds not exceeding 300 knots EAS.
Delete	2.2	The aircraft is limited to altitudes not exceeding 40,000 ft.
Add	2.2	The aircraft is limited to altitudes not exceeding 10,000 ft.
Delete (from Amendment 1)	4.6	The rudder q_c actuator shall be locked at a setting which provides a rudder pedal force of 7.5 lb. per degree of rudder deflection.
Add	4.6	If the rudder q_c actuator is assessed as unserviceable during preflight inspection, it shall be locked at a setting which provides a rudder pedal force of 7.5 lb. per degree of rudder deflection.
Add	4.7	The damping system shall be set at intermediate gain settings which will prevent system instability, and which are compatible with the flight limitations of paragraphs 2.1 and 2.2 above.

DATED 20th March 1958 SIGNED .....

SECRET

Report 71/PROJ 7/1-2

AVRO AIRCRAFT LIMITED

DESIGN CERTIFICATE

FOR FLIGHT TRIALS OF ARROW 1 AIRCRAFT

SERIAL NO. 25201

Aircraft ..... Arrow (CF-105) Mk. 1

Serial No. ..... 25201 ..... Contractor Avro Aircraft Limited

Spec. No. AAMS-105/1 Iss. 1 Dec. 1956 ..... Appendix .....

Contract, I.T.P. or Loan Agreement No. .....

Engine Type ..... Two Pratt & Whitney J.75 Model JT4A23 .....

Arrow 1 Aircraft, Serial No. 25201, is hereby certified for the purpose of carrying out flight trials.

The aircraft is to be operated in accordance with the following:-

1. The recommendations and limitations of Part 4 of the Arrow 1 Pilot's Operating Instructions dated April 1958.
2. The limitations specified in Model Specification AAMS-105/1 Issue 1 December 1956 up to and including amendment No. 2 (Preliminary).
3. Operating restrictions listed in Section C of this document.
4. Special limitations listed in Section B of this Certificate. These over-rule the recommendations and/or requirements of 1,2 and 3 above where applicable.

DATED 20th May 1958 SIGNED .....

DESIGN CERTIFICATE ARROW 1 SERIAL NO. 25201

SECTION B - SPECIAL LIMITATIONS FOR ARROW FLIGHT TRIALS

These limitations together with the Operating Restrictions listed in Section C shall supersede the appropriate limitations of Model Specification AAMS-105/1 Issue 1 December 1956, and the Pilot's Operating Instructions dated April 1958.

1. Taxiing and Take-off Limitations

1.1 The cross-wind component for take-off must not exceed 25 knots.

1.2 Nose wheel steering is not to be used for take-off.

2. Flight Limitations

2.1 The aircraft is limited to speeds not exceeding 500 knots EAS or 1.75 Mach number.

2.2 The aircraft is not to be flown at altitudes exceeding 50,000 ft. for periods exceeding 5 minutes.

2.3 The aircraft is limited to intentional maneuver normal load factors not exceeding a positive load factor equal to $\frac{250,000}{w}$, and a negative load factor equal to $\frac{141,000}{w}$, where w is the weight of the aircraft at the beginning of the maneuver

e.g. $w = 62,500$ lb.

$$n \text{ pos} = \frac{250,000}{62,500} = 4.0$$

$$n \text{ neg} = \frac{141,000}{62,500} = 2.26$$

2.4 The aircraft is limited to intentional rates of roll not exceeding 2.0 rad/sec.

2.5 The aircraft is not to be stalled intentionally.

2.6 The aircraft is not to be flown in inverted flight.

2.7 The aircraft is not to be spun intentionally.

3. Landing Limitations

3.1 All wheels must be in contact with the ground and the speed must be less than 185 knots before the brake parachute may be selected.

4. Special Limitations

4.1 The aircraft is not to be flown in icing conditions (airframe de-icing system inoperative).

4.2 The rain repellant system is not to be operated (system inoperative).

SECTION C - OPERATING RESTRICTIONS

The aircraft shall be operated in accordance with the limitations and restrictions resulting from incomplete qualification testing of the installed equipment, as delineated in Qualification Status Report 71/REL 00/1-3.

A list of equipment items requiring particular attention is given below:-

Note: The "number of flights" limitation is effective from the date of original installation of the noted equipment item, irrespective of total aircraft flights.

Avro Part No.	Description	Limitation
7-1091-303	Wheel Complete - Nose Landing Gear	The lesser of 10 landings, or 100 miles rolling, or excess pressure loss.
7-1062-5569	Cross-shaft Bearing, Rear	Five flights, with preflight inspection.
7-1156-12	Control Panel and TRU	10 hours flight or 200 hours ground application of power.
7-1662-2	Proportioner	Check for by-pass valve operation during each refueling.
7-1956-37	Compensator	The lesser of 10 flights or 25 hours cumulative.

Avro Part No.	Description	Limitation
7-3258-37	Compensator	The lesser of 10 flights or 25 hours cumulative.
CS-V-104	Air Charging Valve and Gauge	Check for leakage after charging and prior to each flight.

General

The aircraft shall be serviced, taken off and landed where the ground air temperature is not less than -20°F.

St. Catherines C/L Armstrong

SECRET

Report 71/PROJ 7/7

AVRO AIRCRAFT LIMITED

DESIGN CERTIFICATE

FOR FLIGHT TRIALS OF ARROW 1 AIRCRAFT

SERIAL NO. 25202 to 25205 INCL.

Aircraft ..... Arrow (CF-105) Mk. 1 .....

Serial No. 25202 to 25205 incl. Contractor Avro Aircraft Limited

Spec. No. AAMS-105/1 Issue 1 Dec. 1956 Appendix .....

Contract, I.T.P. or Loan Agreement No. .....

Engine Type ..... Two Pratt & Whitney J.75 Model JT4A25 .....

Arrow 1 aircraft are hereby certified for the purpose of carrying out flight trials.

The limitations and restrictions specified herein shall be applicable to all aircraft covered by this certificate except where specifically noted.

The aircraft are to be operated in accordance with the following:-

1. The recommendations and limitations of Part 4 of the Arrow 1 Pilot's Operating Instructions dated April 1958.
2. The limitations specified in Model Specification AAMS-105/1 Issue 1 December 1956 up to and including amendment No. 2 (Preliminary).
3. Operating restrictions listed in Section C of this document.
4. Special limitations listed in Section B of this Certificate. These over-rule the recommendations and/or requirements of 1, 2 and 3 above where applicable.

DATED 26th May/1958 SIGNED .....

DESIGN CERTIFICATE ARROW 1 SERIAL NO. 25202 to 25205 INCL.

SECTION B - SPECIAL LIMITATIONS FOR ARROW FLIGHT TRIALS

These limitations together with the Operating Restrictions listed in Section C shall supersede the appropriate limitations of Model Specification AAMS-105/1 Issue 1 December 1956, and the Pilot's Operating Instructions dated April 1958.

1. Taxiing and Take-off Limitations

1.1 The cross-wind component for take-off must not exceed 25 knots.

1.2 Nose wheel steering is not to be used for take-off.

2. Flight Limitations

2.1 a) The aircraft are limited to speeds not exceeding 500 knots EAS or 1.75 Mach number.

b) Serial No. 25202 only: The aircraft is limited to speeds not exceeding 350 knots EAS.

2.2 The aircraft are not to be flown at altitudes exceeding 50,000 ft. for periods exceeding 5 minutes.

2.3 a) The aircraft are limited to intentional maneuver normal load factors not exceeding a positive load factor equal to $\frac{250,000}{W}$, and a negative load factor equal to $\frac{141,000}{W}$, where w is the weight of the aircraft at the beginning of the maneuver.

e.g. $w = 62,500$ lb.

$$n \text{ pos} = \frac{250,000}{62,500} = 4.0$$

$$n \text{ neg} = \frac{141,000}{62,500} = 2.26$$

b) Serial No. 25202 only: The aircraft is limited to intentional maneuver normal load factors not exceeding 2.0 "g" and not less than 0 "g".

2.4 The aircraft are limited to intentional rates of roll not exceeding 2.0 rad/sec.

2.5 The aircraft are not to be stalled intentionally.

2.6 The aircraft are not to be flown in inverted flight.

2.7 The aircraft are not to be spun intentionally.

3. Landing Limitations

3.1 All wheels must be in contact with the ground and the speed must be less than 185 knots before the brake parachute may be selected.

4. Special Limitations

4.1 The aircraft are not to be flown in icing conditions (airframe de-icing system inoperative).

4.2 The rain repellant system is not to be operated (system inoperative).

SECTION C - OPERATING RESTRICTIONS

The aircraft shall be operated in accordance with the limitations and restrictions resulting from incomplete qualification testing of the installed equipment, as delineated in Qualification Status Report 71/REL 00/1-3.

A list of equipment items requiring particular attention is given below:

Note: The "number of flights" limitation is effective from the date of original installation of the noted equipment item, irrespective of total aircraft flights.

Avro Part No.	Description	Limitation
7-1091-303	Wheel Complete - Nose Landing Gear	The lesser of 10 landings, or 100 miles rolling, or excess pressure loss.
7-1062-5569	Cross-shaft Bearing, Rear	Five flights, with preflight inspection.
7-1156-12	Control Panel and TRU	10 hours flight or 200 hours ground application of power.
7-1662-2	Proportioner	Check for by-pass valve operation during each refueling.
7-1956-37	Compensator	The lesser of 10 flights or 25 hours cumulative.

Avro Part No.	Description	Limitation
7-3258-37	Compensator	The lesser of 10 flights or 25 hours cumulative.
CS-V-104	Air Charging Valve and Gauge	Check for leakage after charging and prior to each flight.

General

The aircraft shall be serviced, taken off and landed where the ground air temperature is not less than -20°F.

S/L Armstrong

S/L Oliver

AVRO AIRCRAFT LIMITED

AMENDMENT NO. 4

TO

DESIGN CERTIFICATE

FOR FLIGHT TRIALS OF ARROW 1 AIRCRAFT
SERIAL NO. 25202 TO 25205 INCL.

The following forms a part of, and shall be read in conjunction with, the Design Certificate for Flight Trials of Arrow 1 Aircraft Serial No. 25202 to 25205 inclusive, dated 26 May 1958.

SECTION B - SPECIAL LIMITATIONS FOR ARROW FLIGHT TRIALS

Delete: Para. 2.1 (a) The aircraft are limited to speeds not exceeding 500 knots EAS or 1.75 Mach number.

Add: Para. 2.1 The aircraft are limited to speeds not exceeding 500 knots EAS or 1.9 Mach number.

Delete: Para. 2.2 The aircraft are not to be flown at altitudes exceeding 50,000 ft. for periods exceeding 5 minutes.

Para. 2.3 (a) The aircraft are limited to intentional maneuver normal load factors not exceeding a positive load factor equal to $\frac{250,000}{W}$, and a negative load factor equal to $\frac{141,000}{W}$, where w is the weight of the aircraft at the beginning of the maneuver.

eg: $W = 62,500$ lb.

$$n \text{ pos} = \frac{250,000}{62,500} = 4.0$$

$$n \text{ neg} = \frac{141,000}{62,500} = 2.26$$

Add: Para. 2.3 (a) The aircraft are limited to intentional maneuver normal positive load factors not exceeding a load factor equal to $\frac{150,000}{W}$ during supersonic flight, and $\frac{250,000}{W}$ during subsonic flight, where w is the weight of the aircraft at the beginning of the maneuver.

Continued On Page 2

Add: Para. 2.3 (b) The aircraft are limited to intentional maneuver normal negative load factors not exceeding a load factor equal to $\frac{80,500}{W}$ during supersonic flight, and $\frac{141,000}{W}$ during subsonic flight, where w is the weight of the aircraft at the beginning of the maneuver.

DATE 28th Aug. 1958 SIGNED A. Lindow
for Chief Engineer

S/L R. E. Young
S/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 9730/09/J
Date January 14, 1959
To Mr. S. E. Harper
From T. Roberts
Subject UTILITY HYDRAULICS SYSTEM SURGE PRESSURES ARROW 1 & 2

R.F.T. 07-5103 that investigates maximum pressure surges and duty cycles on the Utility Hydraulics system, in order to determine specification limits on system equipment, is attached.

T. Roberts

T. Roberts
Technical Design Coordinator
Flight Test

c.c.
Messrs R. Lindley
J. Chamberlin
F. Brame
C. Lindow
F. Mitchell
T. Higgins
J. Ames
D. Scard
J. Lynch
J. Hodge
D. Woolley (6)
J. Gale
S. Whiteley
D. Royston
J. Moors
S/L R. E. Young
S/L R. E. Young (2) AVRO T.S.D. RCAF
for transmittal to
S/L K. Owen, C.E.P.E.
Detachment

Central Files

FORM 1749 A

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5103

SHEET NO. 1 OF 1

DATE: January 14, 1959

AIRCRAFT 25201	ASSIGNMENT X74-4419	WORK ORDER NO.

UTILITY HYDRAULICS SYSTEM SURGE PRESSURES

1. OBJECT

To determine maximum pressure surges and duty cycles on the Utility Hydraulics system, to determine specification limits on system equipment.

2. INSTRUMENTATION

2.1 As serviceable at present date, on aircraft 25201.

2.1.1 Return Port pressure regulator 19-008.

2.1.2 Pump Inlet pressure 19-001.

NOTE:- Pressure max. 500 psi. Accuracy required ± 3%. Frequency expected between 30 - 100 cyles.

3. PROCEDURE

3.1 Measurements to be taken on C.M. Data Tape at the following conditions.

3.1.1 During taxi-out, with normal brake use.

3.1.2 During L/G retraction after take-off.

3.1.3 Just prior to landing, extend and retract L/G at max. placard speed and minimum speed.

3.1.4 Speed brake operation - at high and low aircraft speed.

3.1.5 During landing and taxi-in with normal brake operation.

NOTE:- Readings should be continuous for as long as possible prior to landing - at least 20 minutes.

4. DATA

4.1 C.M. Data Tape recordings.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
A. Binding	D. Rayton.	

S/L Armstrong

DEC 5 RECD

Inter-Departmental Memorandum

S/L Armstrong

Ref 6552/16B/J.
Date December 2, 1958
To Mr. S. E. Harper
From T. Roberts
Subject ANTI SKID EVALUATION - A/C 25203

Herewith R.F.T. 07-5102 specifying testing required for a preliminary evaluation of the anti-skid system. This test is uninstrumented except for camera coverage. Should problems arise the testing would be transferred to another aircraft.

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.
Messrs R. Lindley
J. Chamberlin
F. Brame
C. Lindow
F. Mitchell
T. Higgins
J. Ames
D. Seaward
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D. Woolley (6)
J. Gale
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R. Bayliff
W/C G. Waterman
W/C G. Waterman (2) AVRO T.S.D. RCAF
for transmittal to
S/L K. Owen, C.E.P.E.
Detachment

Central Files

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. No. 07-5102

Sheet No. 1 of

Date. December 2, 1958

Aircraft	Assignment No.	Work Order No.
252 03	X73-337	

ANTI SKID EVALUATION

1. OBJECTIVE

To carry out a preliminary evaluation of the anti-skid system.

2. INSTRUMENTATION

	Item Ref.
Camera and pointer - R.H. leg	31-063
Camera and pointer - L.H. leg	31-064

3. TEST PROCEDURE

3.1 White stripes should be painted on tires so that camera records can determine if wheels are skidding.

3.2 Taxi aircraft and carry out progressively harder braking.

3.3 Runway conditions should be as varied as possible, i.e. dry, wet and icy patches.

3.4 Tires should be inspected after each run for flat spots.

3.5 After satisfactory completion of taxi tests carry out landings with anti-skid.

4. DATA

4.1 Pilot's comments.

4.2 Camera records of u/c during taxi.

4.3 Vinten camera records of landing.

R.F.T. Prepared By:

Approved By:

Authorized By:

S/L Armstrong

Inter-Departmental Memorandum

Ref 9062/02A/J
Date December 17, 1958
To Mr. S. E. Harper
From T. Roberts
Subject ANTI SKID PRE FLIGHT TEST

Herewith R.F.T. 07-5102, Add. 1. This test is required prior to taxi tests and is a check out of the system.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

/b

c.c.
Messrs R. Lindley
J. Chamberlin
F. Drame
C. Lindow
F. Mitchell
T. Higgins
J. Ames
D. Scard
J. Lynch
J. Hodge
D. Woolley (6)
J. Gale
C. Marshall
D. Royston
R. Bayliff
W/C G. Waterman
W/C G. Waterman (2)

Central Files

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. No. 07-5102 Add. 1

Sheet No. 1 of

Date. December 13, 1958

Aircraft	Assignment No.	Work Order No.
25203	X73-337	

ANTI SKID PRE FLIGHT TEST

The following testing is required prior to the taxi tests as given in R.F.T. 07-5102.

1. Systems check out

1.1 A test receptacle has been provided on both control boxes that enables a complete check out of the skid control system after all control components have been installed in the aeroplane and connected into the wiring system.

1.2 To check out the control system perform the operations and check for correct performance as given in the following instructions:-

1.3 Check out Procedure

Connect the check out instrument to the test receptacle of one control box at a time. If connection is correct and anti-skid switch on pilots instrument panel is "ON" the power indicating signal on the check out instrument should light. Check out of the anti skid system is then ready to be made and the sequence of operation is tabulated or attached sheet. In calibrating the ohmeter the switches are placed as shown in the top row of the attached table and the ohmeter calibration knob turned till the needle reads infinite resistance. If on the continuity test a reading on the ohmeter is appreciably lower than the specified value in the label then it is most likely some form of short circuit exists. On the other hand a higher value than specified infers a discontinuity or poor connection.

2. After the Skid control system has been checked out to be in satisfactory operating condition the following tests are to be made.

2.1 Brake Response

2.1.1 During the right and left wheel functional tests or a repeat of these tests apply the brakes and observe the action of the brakes during step 1 and step 2 release and re-application. The brakes must release completely during step 2 release, and only partially during step 1 release. Upon completion of the releases the brakes shall go back on.

Prepared By: Approved By: Authorized By:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. No. 07-5102 Add. 1

Sheet No. 2 of

DATE. December 13, 1958

Aircraft	Assignment No.	Work Order No.
25203	X73-337	

2.1.1 During brake response tests continuous recordings should be made of the following signals and pressures:-

Brake pressure upstream of valve
Brake pressure at brake unit.
Skid Signals.
Return line press at anti-skid valve.

3. Should the pressure traces show any indication that the operation of the anti-skid valves is having effect on the Emergency system lock out at the brake control valve further tests involving cycling of the anti-skid valves may be necessary.

4. Operation of the Hydraulic fuses must be check as follows:-

4.1 The system just be bled by releasing measured 15 cu/in quantities of fluid at a time during brake application. After all air has been removed from the system repeat the operation twice more each time observing brake operation after closing off flow of fluid.

4.2 Functioning of the fuse should be checked by breaking the joint of the supply line at the cylinder block to simulate a leak. The fuse should prevent flow from the broken joint and should not reset until either the pressure upstream of the fuse has dropped below 90 psi or a pressure not more than 500 psi has been applied to the line downstream of the valve.

4.3 NOTE:- Any attempts to bleed greater amounts through the valve than specified in para. 4.1. should result in the conditions described in para. 4.2 and the fuse should be reset in a similar manner.

R.F.T. Prepared By: Approved By: Authorized By:

OPERATION	FUNCTION SWITCH	CONTINUITY switch	METER SWITCH	A.C. SWITCH	METER READING	STEP 1 LIGHT	STEP 2 LIGHT	REMARKS
Ohmeter Calibration	1	1	ON	OFF	∞	OFF	OFF	Adjust Ohmeter Pot Until needle reads ∞
R.H. Rotation alternator		2			320			
L.H. Rotation alternator		3			320			
R.H. rate alternator		4			400			
L.H. rate alternator		5			400			
L.H. valve solenoids		6			120 ⚠1			
R.H. valve solenoids		7			120 ⚠1			
R. Wheel functional	2	any (inef)	off	ON	Ineffective			
Step 1 push button						ON	OFF	
Step 2 push button						OFF	ON	
Locked wheel & Fail Safe push button						ON	ON	Both lights should go off after 4 seconds
Arming push button				OFF		ON	ON	⚠2
L. Wheel functional	3			ON		OFF	OFF	
Step 1 push button						ON	OFF	
Step 2 push button						OFF	ON	
Locked wheel & fail safe push button						ON	ON	Both lights should go off after 4 seconds
Arming push button				OFF		ON	ON	⚠2

⚠1 Providing no external electrical connection between left and right hand valve solenoids.

⚠2 Lights are on only while button is depressed. Hold for approx. 10 secs. - fail safe should not actuate.

F/L Armstrong

Inter-Departmental Memorandum

Ref 9372/09/J
Date December 30, 1958
To Mr. S. E. Harper
from T. Roberts
Subject ANTI SKID SYSTEM TEST PROCEDURE

Subsequent to the issue of R.F.T. 07-5102 and addendum 1, covering anti-skid system evaluation Bendix Pacific Report No. 8-320 has become available, in which the test procedure for the anti-skid system is detailed. This test procedure is included in the attached R.F.T. 07-5102 addendum 2, which supercedes and cancels the original issue of R.F.T. 07-5102.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.
Messrs R. Lindley
J. Chamberlin
F. Brame
C. Lindow
F. Mitchell
T. Higgins
J. Ames
D. Seard
J. Lynch
J. Hodge
D. Woolley (6)
J. Gale
C. Marshall
R. Rose
R. Bayliff
W/C G. Waterman
W/C G. Waterman (2) for transmittal to
S/L K. Owen, C.F.P.E.
Detachment

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO
REQUISITION FOR FLIGHT TEST

R.F.T. No. 07-5102 Add. 2

Sheet No. 1 of

DATE. December 30, 1958

Aircraft	Assignment No.	Work Order No.
25203	Y73-337	

ANTI-SKID SYSTEM EVALUATION

NOTE:- This addendum supercedes and cancels R.F.T. 07-5102.

1. OBJECTIVE

To carry out a preliminary evaluation of the Bendix Pacific anti-skid system.

2. INSTRUMENTATION

		Item Ref.
2.1	Camera and pointer - R.H. leg.	31-063
2.2	Camera and pointer - L.H. leg.	31-064
2.3	White stripes should be painted on the tires so that camera records can indicate wheel skidding.	

3. TEST PROCEDURE

After the anti-skid control system has been checked out as per R.F.T. 07-5102 addendum1, and is performing correctly, the following tests should be made:-

3.1 Response Times

The pilot should check the brake response with the engines at idling thrust by releasing the brakes, allowing the aircraft to roll a few feet, then rapidly applying the brakes. This should be repeated at slightly higher speed. The pilot should note the brake response time relative to his rate of application. If brake response time is acceptable, testing may be continued.

3.2 Low Speed Taxi Tests

Bring the aircraft up to 25 to 40 knots, and brake to a stop with moderate application of brakes. Skid control action may or may not be initiated. If the aircraft is stopped satisfactorily high speed stops may be made.

3.3 High Speed Taxi Tests

3.3.1 Bring the aircraft up to 60 to 80 kts. apply moderate braking, and bring the aircraft to a stop.

Repeat this test using hard braking (Hard braking implies full or near full brake pressure application by the pilot).

R.F.T. Prepared By:	Approved By:	Authorized By
W.C. Etherington	D. Layton	

AVRO AIRCRAFT LIMITED
MALTON, ONTARIO
REQUISITION FOR FLIGHT TEST

R.F.T. No. 07-5102 Add. 2
Sheet No. 2 of 2
Date. December 30, 1958

Aircraft	Assignment No.	Work Order No.
25203	X73-337	

3.3.2 Bring the aircraft up to 120 kts indicated (or maximum practical speed at the discretion of the pilot) and bring to a stop by the application of moderate braking.

Repeat this test using hard braking.

NOTE:- Results of the above tests should permit qualitative evaluation of the operation of the anti-skid system before undertaking landing trials. If there are no flat spots on the tires, and no skidding has been observed, it can be assumed that the anti-skid system is at least preventing locked wheel conditions.

Camera records should be examined for evidence of walking prior to undertaking landing trials.

3.4 Landing Tests

Land the aircraft and bring it to a stop using moderate braking. Measure the landing roll distance.

Repeat this test using hard braking, and again measure the landing roll distance.

4. CONDITIONS

4.1 Runway conditions should be as varied as possible, i.e. dry, wet, with icy patches.

4.2 Tires should be examined after each run for flat spots.

5. DATA

5.1 Pilot's comments

5.2 Camera records of undercarriage during taxi.

5.3 Vinten camera records of landings.

R.F.T. Prepared By:	Approved By:	Authorized By:
Wm C. Etherington	D. Laycock	

S/L Armstrong
DEC 1 REC'D

Inter-Departmental Memorandum

Ref 81/61/08/J
Date November 28, 1958
To Mr. S. M. Harper
From T. Roberts
Subject COCKPIT EVALUATION TESTS

Herewith R.F.T. 07-5101, specifying a test required on any Arrow 1 aircraft.

T. Roberts
Technical Design Coordinator
Flight Test

/b

C.C.
Messrs R. Lindley
J. Chamberlin
F. Brame
C. Lindow
D. Rogers
W. Potocki
F. Mitchell
T. Higgins
J. Ames
D. Scard
J. Lynch
J. Hodge
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C. McIntosh
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. No. 07-5101

Sheet No. 1 of 1

DATE. November 27, 1958

Aircraft	Assignment No.	Work Order No.
25201 or 25203 or 25204	X73-384	

COCKPIT EVALUATION

1. OBJECTIVE

To determine the maximum height to which a pilot can be elevated in the cockpit and still reach to his satisfaction all switches, controls, etc.

2. TEST PROCEDURE

Two pilots should do this evaluation, each wearing full flying equipment. The spread in physical dimensions should be as large as possible.

The canopy is to be left open during this evaluation.

3. DATA

Pilot's comments and report on the evaluation.

R.F.T. Prepared By? Approved By: Authorized By:

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Inter-Departmental Memorandum

S/L Armstrong

Certainly About time we knew what an A+E is for Ken

Ref 8620/01/J
Date December 4, 1958
To Mr. S. E. Harper
From T. Roberts
Subject ACCEPTANCE TESTS - A/C 25205

Herewith R.F.T. 07-5100, specifying the points to be checked on the current flight envelope for acceptance purposes.

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

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MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. No. 07-5100

Sheet No. 1 of 1

SECRET

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Date. December 8, 1958

Aircraft	Assignment No.	Work Order No.
252 05	X74-4314	

PRELIMINARY ACCEPTANCE FLIGHTS

1. OBJECTIVE

To clear the aircraft during flights within the limits of the current flight envelope.

2. INSTRUMENTATION

Accident investigation telemetry.

3. TEST PROCEDURE

* 3.1 At 7,500' and 300 kts. EAS pull 'g' corresponding to nW = +250,000 lb, followed by nW = -90,000 lb.

* 3.2 Repeat 3.1 at 425 kts. EAS.

* 3.3 At 35,000 ft. at M = 1.3 pull 'g' corresponding to nW = + 170,000 lb, followed by nW = 0.

3.4 At 45,000 ft. accel. to M = 1.8 in level flight. Decelerate by cutting afterburners, do not reduce RPM above M = 1.5.

4. DATA

4.1 Pilot's comments.

* These are not to be "check pitching manoeuvres".

R.F.T. Prepared

Approved By:

Authorized By:

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 8116/04/J
Date November 20, 1958
To Mr. S. E. Harper
From T. Roberts
Subject ENGINE OIL PRESSURE SWITCH

Herewith R.F.T. 07-5097 specifying testing required during engine run on an Arrow 1. It is suggested that this be done on A/C 25204 because of the impending engine change.

T. Roberts

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5097

SHEET NO. 1 OF

DATE: November 20, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25204	X73-384	

CHECK ON ENGINE OIL PRESSURE SWITCHES

1. OBJECTIVE

To determine the 'g' and frequency on the engine oil pressure switch during an engine run.

2. REASON FOR TEST

During engine runs on Nov. 8th on A/C 25201 the R.H. engine oil pressure switch was supplying pulse signals throughout the run. This type of fault has been detected on A/C 25202 and 25203 and may be due to vibration.

3. INSTRUMENTATION

3.1 Oscillograph

1. Acceleration at the engine oil pressure switch.

4. TEST PROCEDURE

During engine run, between idling and military power, record on continuous trace the acceleration at the pressure switch.

5. DATA

Report on test showing amplitude and frequency of vibration.

NOTE:- Since the installation of the transducer requires pulling an engine it is suggested that this be installed on A/C 25204 at the time of the next engine change.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

S/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 7921/07/J
Date November 14, 1958
To Mr. S. E. Harper
From T. Roberts
Subject FLYING CONTROL SYSTEM TESTING ON A/C 25202

Herewith R.F.T. 07-5096, specifying testing required on the flying control system on the above aircraft prior to commencing repair work. An advance copy of this R.F.T. has been supplied to Mr. D. Woolley and the test carried out. The attached is therefore for record purposes only.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

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MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5096

SHEET NO. 1 OF

DATE: November 12, 1958

AIRCRAFT 25202	ASSIGNMENT X73-384	WORK ORDER NO.

FLYING CONTROL SYSTEM TESTING

1. PURPOSE OF TEST

To investigate the cause of restriction of stick movement in the Pitch axis during Flight No. 22.

2. CONDITION OF TEST

2.1 This test is to be completed before the control system is operated or in any way disturbed for any other purpose.

2.2 A hydraulic test rig should be made available - to be connected only on specific instruction from Systems Engineering Dept.

2.3 Access panels to be removed from both elevator jack boxes and rear quadrant to be exposed.

2.4 The following equipment will be required:-

(a) Head phones between cockpit, rear quadrant, and elevator boxes.

(b) Spring balance to measure stick force.

(c) Means of recording Elevator Angle.

3. TEST PROCEDURE

3.1 Visual investigation of Elevator Control system.

1. Stick below floor.
2. Front quadrant installation.
3. Cable tension regulator.
4. Parallel Servo installation.
5. Feel-trim unit installation.
6. Follow-up linkage on the actuator.
7. Valve and differential servo.
8. Valve dampers.

4. SIMULATION OF FOULING

Connect hydraulic rig.

4.1 Trim to 4° up elevator. Operate stick to approximately $\pm 2^{\circ}$ elevator, observing all components for proper functioning.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5096

SHEET NO. 2 OF 2

DATE: November 12, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25202	X73-384	

4.2 Repeat 1. with elevator trimmed to 3°, 2°, 1°, and 0° up elevator, also 1°, down elevator.

5. CALIBRATIONS

1. Measure stick travel for various trim positions.
2. Calibrate stick position vs elevator angle.
3. Calibrate stick force vs elevator angle for various trim position.
4. Calibrate system friction.

6. Investigate Feel Trim Unit, Valve Dampers, Control Valves, Parallel Servo, Cables, etc., individually as required.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

E/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 7920/09/J
Date November 14, 1958
To Mr. S. E. Harper
From T. Roberts
Subject BRAKING SYSTEM TESTS ON A/C 25202

Herewith R.F.T. 07-5095 specifying testing required on the braking system on the above aircraft prior to commencing repair work. An advance copy of this R.F.T. has been supplied to Mr. D. Woolley and the test carried out. The attached is therefore for record purposes only.

T. Roberts

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5095

SHEET NO. 1 OF 1

DATE: November 12, 1958

AIRCRAFT 25202	ASSIGNMENT X73-384	WORK ORDER NO.

BRAKING SYSTEM TESTS

The following investigation and testing is required on A/C 25202 prior to commencing repair work.

1. Inspect R.H. gear for wear at brake pots - check piping at bottom leg - check brakes in general.

2. Inspect L.H. gear for wear at brake pots - check piping at bottom leg - check brakes in general.

3. Blank off broken lines in R.H. wheel well - install pressure gauges in normal and emergency brake lines.

4. Check position of utility compensator piston - i.e. is any oil left in the system:-

   4A. Check parking brake position.

5. Remove pack check position of brake valve operating pistons.

6. Connect up H.T.M.T. - pressurize system check L.H. side for leaks. Check R.H.S. pressure gauges, should read return pressure only.

7. Put gauges in L.H.S. normal and emergency lines.

8. Pressurize system and check for L.H.S. brake pressure.

9. Operate brakes - 10 times check for smoother operation and release.

10. Pressurize L/G up lines to brake valves to 4000 psi - check operations of anti-spin feature of valves - check 10 times for smooth operation and release of brake pressure.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

NOV 26 REC'D

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 8170/09/J
Date November 21, 1958
To Mr. S. E. Harper
From T. Roberts
Subject BRAKING SYSTEM TESTS ON A/C 25203

Herewith R.F.T. 07-5095, Add. 1, specifying testing required on the braking system on the above aircraft. An advance copy of this R.F.T. has been supplied to Mr. D. Woolley and the test carried out. The attached is therefore for record purposes only.

T Roberts

TR/bb

T. Roberts
Technical Design Coordinator
FLIGHT TEST

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5095 Add. 1

SHEET NO. 1 OF 1

DATE: November 14, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25203	X73-384	

BRAKE SYSTEM TESTS

1. OBJECT

Investigation of brake system on 25201 and 25203 because of accident on A/C 25202.

2. INSTRUMENTATION

Pressure transducers to measure pressure in (1) the brake pots of the fwd. L. & R.H. wheels. (2) Brake control valve return port R. & L. H.S. (3) Normal brake port R. & L. H.S. (4) Anti-spin line.

3. PROCEDURE

1. Brakes to be applied and released.

   (a) Slowly
   (b) Moderately
   (c) Quickly

   Under Technical Design supervision.

2. Do L/G retractions to evaluate anti-spin.

3. Do S/B operations.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

S/c Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 7701/09/J
Date November 7, 1958
To Mr. S. E. Harper
From T. Roberts
Subject LANDING DISTANCE

Herewith R.F.T. 07-5094, specifying a test required on any Arrow 1 as soon as possible.

T. Roberts

TR?b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5094

SHEET NO. 1 OF 1

DATE: November 7, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
Arrow 1	X73-380	

LANDING DISTANCE WITHOUT BRAKE PARACHUTE

1. OBJECTIVES

1.1 To ascertain the feasibility of landing on the short runways.

2. TEST PROCEDURES

2.1 Using the long runway carry out normal approach and touchdown. Pilot to use maximum safe braking effort and no brake parachute during ground run.

3. DATA

3.1 Vinten camera record.

3.2 Wind speed and direction.

3.3 Ambient temperature.

3.4 Brake temperatures.

3.5 Pilot's comments.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

NOV 12 REC'D
F/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 7745/09/J
Date November 10, 1958
To Mr. S. E. Harper
From T. Roberts
Subject EMERGENCY BRAKE CHECK

Herewith R.F.T. 07-5093, specifying Emergency Brake testing required on Arrow 1, dependent on aircraft availability.

T. Roberts

T. Roberts
Technical Design Coordinator
Flight Test

c.c.
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5093

SHEET NO. 1 OF

DATE: November 5, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
ARROW 1	X73-384	

EMERGENCY BRAKE CHECK

1. OBJECTIVE

To check the leakage rate of the emergency brake circuit as installed on Arrow 1 aircraft.

2. TEST PROCEDURE

2.1 Flatten brake accumulator and record precharge pressure.

2.2 Charge utility system to 4,000 psi approximately.

2.3 Flatten normal system accumulator by operating speed brakes or controllable check valve.

2.4 Record brake accumulator pressure.

2.5 Before brakes are applied again or normal system is charged - record brake accumulator pressure and time interval since reading 2.4 above.

2.6 Repeat on all Arrow 1 aircraft as often as possible unitl sufficient results are obtained to determine the trend.

NOTE Do not apply parking brake.

3. DATA

Brake accumulator pressures and time intervals.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
	Clayton.	

S/L Owen

c/c Armstrong

NOV 10 RECD

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AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 5185/09/J
Date October 24, 1958
To Mr. S. E. Harper
From T. Roberts
Subject NYLON PARACHUTE TESTS

R.F.T. No. 07-5092, covering tests to assess the deformation characteristics of nylon parachutes after streaming on aircraft 25201 , is attached.

T Roberts

WE/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.
Messrs C. Lindow
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C. Marshall
H. Malinowski
B. Tennant
D. Scard
D. Woolley
J. Lynch
J. Gale
J. Ames
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

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R.F.T. NO. 07-5092

SHEET NO. 1 OF

DATE: October 24, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25201		

NYLON PARACHUTE TESTS

1. OBJECT

To determine if nylon parachutes are free from the permanent deformations found in dacron parachutes after streaming.

2. EQUIPMENT

2.1 Three nylon parachutes (24 ft. dia.).

2.2 Two movie cameras - one at 64 fps and the other set at 100 fps.

2.3 Dynamic deployment load as per R.F.T. 5034, IDM 9671/01J.

3. PROCEDURE

3.1 Each nylon parachute is to be streamed twice. The maximum airspeed at which the brake parachute may be selected is 185 knots.

3.2 In each case the following measurements are required:-

3.2.1 Wind speed and direction.

3.2.2 Aircraft velocity vs time.

3.2.3 Dynamic deployment load vs time.

3.3 Complete two camera movie coverage of each streaming sequence is required.

3.4 Each suspension line is to be measured before streaming, immediately after streaming, and at twenty-four hours intervals thereafter until no further shrinkage can be detected.

3.5 All marks and damage are to be recorded.

3.6 Pilot comments on parachute performance are required.

4. DATA

4.1 Results of 3.2, 3.3, 3.4, 3.5, 3.6, are required.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
N B Tennant		

F/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 4182/07/J
Date September 25, 1958
To Mr. S. E. Harper
From T. Roberts
Subject CALIBRATION OF HINGE MOMENT LIMITER

Herewith R.F.T. 07-5089, which covers testing on Hinge Moment Limiters on aircraft 25202 and 25203.

T. Roberts

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5089

SHEET NO. 1 OF

DATE: September 17, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25202 and 25203	X73-319	

CALIBRATION OF HINGE MOMENT LIMITER

The following test is required on the rudder system of the above aircraft.

1. OBJECTIVE

To obtain a curve of rudder deflection vs q_c for 150 lb. pedal load.

2. INSTRUMENTATION

1. Pitot-static tester
2. Rudder angle
3. Pedal force.

3. TEST PROCEDURE

1. Aircraft electrics and hydraulics should be on, q_c system circuit breakers must be in. The Damper Amp. Cal. must be connected.
2. Automatic rudder feel should be selected in the pilots cockpit.
3. Hook up the pitot-static tester to the nose boom.
4. Apply 150 lbs. load to either rudder pedal and measure corresponding rudder deflection
5. Repeat for the other pedal.
6. Repeat 4 and 5 for q_c of 100, 150, 200, 300, 400 & 500 p.s.f.

4. DATA

4.1 Table of rudder angle and q_c for 150 lb pedal force.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
A. Smith		

AVRO AIRCRAFT

Inter-Departmental Memorandum c/c Armstrong

Ref 3839/09/J
Date September 16, 1958
To Mr. S.E. Harper
From T. Roberts
Subject NOSE WHEEL RETRACTION

Herewith R.F.T. 07-5088, covering test required on A/C 25203 during its normal operation.

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5088

SHEET NO. 1 OF 1

DATE: September 11, 1958

AIRCRAFT 25203	ASSIGNMENT X73-384	WORK ORDER NO.

NOSE WHEEL RETRACTION

1. OBJECTIVE

At the present time Arrow 1 aircraft have a restrictor in the undercarriage hydraulic system to ensure centreing of the nose wheel prior to retraction. It is required to obtain statistical data on the nose wheel position during take-off to determine if the restrictor is necessary.

2. INSTRUMENTATION

2.1 Oscillograph

(1) Nose wheel angle.

3. TEST PROCEDURE

Record on continuous trace the nose wheel angle during take-off, from nose wheel unstick to gear up. This should be done on all flights until notified otherwise by Technical Design.

4. DATA

As listed in section 2.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 3287/04/J
Date August 29, 1958
To Mr. S. E. Harper
From T. Roberts
Subject AIRCRAFT 25202 ENGINE CALIBRATION TESTS

R.F.T. No. 07-5087, covering calibration of the 'performance' engines in aircraft 25202 during ground engine runs, is attached.

T. Roberts

WE/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5087

SHEET NO. 1 OF 2

DATE: August 29, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25202		

J75-P5 ENGINE CALIBRATION IN AIRCRAFT 25202

1. OBJECT

1.1 To calibrate the 'performance' engines in Aircraft 25202 during ground engine runs.

1.2 To obtain voltage dropping resistor values for the Emergency Alternator system.

2. INSTRUMENTATION

2.1 Engine ground run trailer, with provision for recording the following:-

2.1.1 Barometric pressure

2.1.2 Ambient air temperature

2.1.3 Compressor face pressure - P_{t_2} (L.H. and R.H.)

2.1.4 Turbine exit pressure - P_{t_7} (L.H. and R.H.)

2.1.5 H.P. rotor RPM - N_2 (L.H. and R.H.)

2.1.6 L.P. rotor RPM - N_1 (L.H. and R.H.)

2.1.7 Engine fuel flow (L.H. and R.H.)

2.1.8 Fuel temperature at F.C.U. (L.H. and R.H.)

2.1.9 Burner pressure (L.H. and R.H.)

2.1.10 Turbine outlet temperature - T_{t_7} (L.H. and R.H.)

2.2 Balance box for Emergency Alternator system tests.

3. PROCEDURE

3.1 Engine calibrations should be performed as detailed in 'Phase 6' of the Engine Test and Installation Procedure issued as an attachment to R.T. 08-742 Addendum 9. Three calibration test runs per engine should be carried out, with the maximum practical difference in ambient temperature between runs.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
Wm C. Etherington	D.A. Ridley	

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5087

SHEET NO. 2 OF 2

DATE: August 29, 1958

AIRCRAFT 25202	ASSIGNMENT	WORK ORDER NO.

3.2 Obtain proper voltage dropping resistor values in the Emergency Alternator circuitry to balance the voltages on the Emergency A.C. Bus within tolerances, with all Emergency A.C. loads connected during Emergency Alternator operation.

4. DATA

4.1 Calibration results from all three test runs.

4.2 Voltage dropping resistor values.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
Wm C. Etherington	D A Ridler	

AVRO AIRCRAFT LIMITED

INTER-DEPARTMENTAL MEMORANDUM

Date: August 27, 1958
To: S.E. Harper
From: T. Roberts
Subject: TAXI EVALUATION OF MIRROR LANDING SYSTEM

R.F.T. No. 07-5086, covering a pilot's assessment of the mock-up installation of the proposed Pilot's Aid Mirror System during a taxi test, is attached.

T. Roberts

WE/ms

T. Roberts
Technical Design Coordinator

cc:
Messrs. J. Chamberlin
F. Brame
C. Lindow
C. Marshall
F. Mitchell
P. Martin
D. Scard
D. Woolley (6)
D. Rogers
J. Scott
J. Gale
C. McIntosh
R. Lewis
J. Lynch
S. Whiteley
J. Ames
W/C G. Waterman
W/C G. Waterman (2) ~~Avro~~ T.S.D. R.C.A.F.

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5086

SHEET NO. 1 OF

DATE: August 27, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25203	X73-4138	

TAXI EVALUATION OF MOCK-UP PILOT'S LANDING

AID MIRROR SYSTEM

1. OBJECT

To evaluate the mock-up installation of the proposed Pilot's Landing Aid Mirror System during a taxi test of aircraft 25203. (This installation is not suitable for flight).

2. EQUIPMENT

Mirrors should be installed as detailed in SK 21953. This installation provides for easy removal of the mirrors to prepare the aircraft for flight.

3. PROCEDURE

The pilot should raise the nose of the aircraft to approximate "approach" attitude during a taxi-run, and should assess the suitability of the mirror system as a landing aid.

4. DATA

Pilot's comments.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
Wm C. Ethwright		

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 5218/09/J
Date October 27, 1958
To Mr. S.E. Harper
From T. Roberts
Subject EVALUATION OF MIRROR LANDING SYSTEM

Herewith R.F.T. 07-5086, Add. 1, covering testing required during an actual landing on the above system. This R.F.T. cancels the taxi requirements of R.F.T. 07-5086.

T. Roberts

/bb

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.
Messrs J. Chamberlin
F. Brame
C. Lindow
T. Higgins
D. Scard
D. Rogers
W. Potocki
J. Hodge
J. Ames
S. Whiteley
J. Lynch
J. Gale
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J. Scott
C. Marshall
C. McIntosh
W/C G. Waterman
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5086 Add. 1

SHEET NO. 1 OF

DATE: October 27, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25201	X73-4138	

FLIGHT EVALUATION OF MOCK-UP PILOT'S LANDING AID MIRROR SYSTEM

1. OBJECTIVE

To evaluate the mock-up installation of the proposed Pilot's Landing Aid Mirror during approach and landing on the 13th flight of A/C 25201.

2. EQUIPMENT

Mirrors should be installed as detailed in drawing no. SK21953. This installation is not considered acceptable for general flight, but has been accepted by Mr. W. J. Potocki for one flight with a limited fuel load in order to carry out the evaluation.

3. TEST PROCEDURE

The pilot should approach and land using the "mirror aid", noting the suitability of the mirror system as a landing aid.

4. DATA

4.1 Pilot's comments

4.2 Vinten camera records of the approach and landing from which speed can be derived.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

S/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 3352/22/J
Date September 2, 1958
To Mr. S. E. Harper
From T. Roberts
Subject AIRCRAFT 25203 - FIRST FLIGHT

Herewith R.F.T. 07-5085 Add. 1 giving the tests required on the first flight of the above aircraft. This addendum supercedes any other R.F.T.'s issued to cover the first flight of this aircraft.

T. Roberts

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

C.C.
Messrs R.N. Lindley
J.A. Chamberlin
C.V. Lindow
F.H. Brame
F.P. Mitchell
D. Rogers
D.N. Scard
D. Woolley (6)
S. Whiteley
J. Ames
J. Lynch
J. Gale
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Detachment
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5085 Add. 1

SHEET NO. 1 OF

DATE: September 2, 1958

AIRCRAFT 25203	ASSIGNMENT X73-380	WORK ORDER NO.

FIRST FLIGHT OF A/C 25203

1. OBJECTIVES

1.1 Check for vibration with U/C doors shut.

1.2 Obtain photographs of aircraft against horizon.

1.3 Assess behaviour of yaw damper.

2. INSTRUMENTATION

2.1 Photo panel to be recording during flight.

2.2 Two chase aircraft are required: one sabre 6 and one CF100 Mk. 5.

2.3 Two Vinten F47 Cameras.

2.4 One high speed camera (approx. 1000 frames/sec)

(items 2.4 and 2.5 are to cover taxi runs and take-off and landing).

3. AIRCRAFT CONFIGURATION

3.1 Undercarriage extended during entire flight.

3.2 Undercarriage doors to be locked in the shut position.

4. TEST PROCEDURE

4.1 Prior to first flight, taxi runs up to approx. 120 kts, should be carried out to check the functioning of the landing parachute, the wheel brake system, and the damping system.

4.2 A pre-flight cockpit check should be carried out as given in Appendix 1 of R.F.T. 07-5024.

4.3 Aircraft speed is restricted to 250 knots EAS. Pilot to note any vibration during flight due to the gear being extended.

4.4 At 10,000 ft. between 200 kts. EAS and 250 kts. EAS. assess handling with damper off.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5085 Add. 1

SHEET NO. 2 OF

DATE: September 2, 1958

AIRCRAFT 25203	ASSIGNMENT X73-380	WORK ORDER NO.

4.5 Yaw Damper Checks

4.5.1 At flight condition of 4.4 engage normal damper gear down mode and assess handling.

4.5.2 Repeat 4.5.1 with emergency damper gear down mode.

4.5.3 Repeat 4.5.1 with normal damper gear up mode.

4.5.4 Repeat 4.5.1 with emergency damper gear up mode.

4.6 C_L vs α Checks

4.6.1 At a convenient altitude obtain photographs of the aircraft against the horizon between minimum safe flying speed, (approx. 160 kts. EAS), and 250 kts. EAS such that a curve of C_L vs α can be obtained.

5. DATA

5.1 Photographic records of 4.6.1.

5.2 Pilot's comments.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

AVRO AIRCRAFT

Inter-Departmental Memorandum

S/L Armstrong
Route Note 2 - this could be interesting
K.J. Owen.

Ref 2718/05/J
Date July 29, 1958
To Mr. S.E. Harper
From T. Roberts
Subject FUEL PRESSURIZATION SYSTEM AIR TEMPERATURES

R.F.T. 07-5084, covering tests to measure the temperature of the air supply to the fuel pressurization system during ground engine running of aircraft 25202, is attached.

T. Roberts

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.
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A. Thomann
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5084

SHEET NO. 1 OF

DATE: July 29, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-4153	WORK ORDER NO. 63138-08-4153-2

FUEL PRESSURIZATION SYSTEM AIR TEMPERATURES

During ground engine running with the aircraft stationary record temperature of the air supply to the fuel pressurization system during the following operations:-

1. With one engine only operating at 70% N_2 RPM switch off the air conditioning cooling turbine. Record temperature of the air supplied to the fuel pressurization system at 2 min. intervals until stabilized.

2. Increase N_2 RPM in 5% steps allowing stabilization at each stage prior to proceeding.

3. When stabilized temperature has reached or exceeded 350°F reduce steps to 1%.

4. Record N_2 RPM corresponding to 400°F temperature.

5. With the N_2 RPM established in step 4 stabilized switch on the air conditioning cooling turbine. Record temperature in the fuel pressurization supply line at 2 min intervals till stabilized.

6. With N_2 RPM stabilized as in step 5 retard the throttle to idle and record temperature as before.

7. Report Ambient temperature.

NOTE:-
1. Tests on the air conditioning test rig indicate that stabilization times may be of the order of 15 minutes. Under these circumstances it is important that the cockpit operater proceed with the successive phases of the test only after being informed of stabilization from the observer on the temperature indicator.
2. Extreme caution is urged in approaching the 400°F limit on this temperature since under ideal conditions fuel can ignite spantaneously in contact with a surface at 450°F.
3. A/C 25202 has been requested since instrumentation was installed in this aircraft previously for this test but adequate safety facilities did not exist at the time the test was scheduled.

R.F.T. PREPARED BY: Wm. C. Etherington	APPROVED BY: C. Counsel [signature]	AUTHORIZED: [signature]
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

S/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 3041/09/J
Date August 21, 1958
To Mr. S. E. Harper
From T. Roberts
Subject TESTS OF FABRIC BASE LAMINATED TREAD TIRES.

R.F.T. No. 5082, covering tests of Goodyear fabric base laminated tread tires on aircraft 25202, is attached.

T. Roberts

T. Roberts
Technical Design Coordinator
FLIGHT TEST

WE/b

c.c.
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R. Baylis
S. Whiteley
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5082

SHEET NO. 1 OF

DATE: August 21, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25202	X73-4012	

FABRIC BASE LAMINATED TREAD TIRES

1. OBJECT

To evaluate fabric base laminated tread tires by comparing their performance with that of standard ribbed tread tires.

2. EQUIPMENT

2.1 Pyrometer for measuring tire tread temperatures.

2.2 Fabric tread tires should be fitted to the L.H. rear and R.H. forward wheels, and standard Type VII tires to the remaining wheels. If possible, the standard type tires should be unused.

3. PROCEDURE

3.1 Taxi the aircraft out and from the rolling gate up Runway 14/32 and return, performing turns. The Stress Department states that controlled radius of turn must be used to prevent excessive induced torque in the undercarriage legs. The suggested minimum radius of turn, measured from the centreline of the aircraft, is approx. 27 feet for 68,000 lb. aircraft weight. If possible an equal number of L.H. and R.H. turns should be made to give equal severity of use to R.H. and L.H. units. Taxi speeds should be recorded if practical, if not they should be estimated.

The tires should be examined at:-

(a) Rolling gate before start.

(b) The far end of the runway.

(c) Rolling gate on return.

comparing wear between the old and new types of tires. The tires are to be examined for tread chipping, cutting, and tearing, and the temperature at the tread should be recorded.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
Wm C. Etherington		

FORM 1749 A

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED

R.F.T. NO. 07-5082

SHEET NO. 2 OF 2

DATE: August 21, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-4012	WORK ORDER NO.

3.2 On satisfactory completion of the taxi test, one take off and landing should be carried out, again recording the tire condition before and after the flight.

3.3 When the type VII tires require replacement, they can be replaced by Fabric Tread Tires, and the flying program on the aircraft continued. The tires should be examined before and after each flight, and their condition should be recorded. The number of landings effected, the approximate mileage run before replacement, and the reason for replacement should be recorded for each tire. All tires should be photographed if any substantial difference in rate of wear between type VII tires and fabric tread tires becomes evident.

This test is to continue until the original four Fabric Tread tires on the aircraft have all been replaced.

4. CONDITIONS

4.1 Personnel concerned with the maintenance and inspection of Fabric Tread tires should be acquainted with the fact that they can be safely used with the fabric showing due to tread wear and that there is no need to replace a tire until it is worn down to the bottom of the grooves in the tread pattern.

4.2 Goodyear personnel are to witness the taxi test and the first take-off and landing.

5. DATA

5.1 Report on taxi test of section 3.1.

5.2 Report on pre-flight and post-flight tire examinations.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

S/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 2455/09/J
Date July 22, 1958
To Mr. S. E. Harper
From T. Roberts
Subject ARROW 1 - DECELERATION PARACHUTE

Herewith R.F.T. 07-5081, giving the photographic coverage required for the Deceleration Parachute during the next series of flights on A/C 25202.

T. Roberts

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.
Messrs R.N. Lindley
J. Chamberlin
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F. Mitchell
J. Scott
S. Whiteley
D. Scard
D. Woolley (6)
J. Lynch
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W/C G. Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen, C.E.P.E. Detachment.

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5081

SHEET NO. 1 OF 1

DATE: July 22, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-4093	WORK ORDER NO.

DECELERATION PARACHUTE

1. OBJECT OF TEST

1.1 To record the deceleration parachute position relative to aircraft centreline from directly aft of the aircraft during landing.

1.2 To observe and record at close quarters configuration of deceleration parachute when inflated.

2. INSTRUMENTATION

2.1 No aircraft instrumentation necessary.

2.2 Camera coverage during landing and after the aircraft has come to rest both movie and still.

3. TEST PROCEDURE

3.1 During landing run movie records taken directly from behind the aircraft to be obtained. This should be repeated for a minimum of 4 or 5 landings.

3.2 Upon completion of taxi and before jettisoning parachute, pilot to bring the aircraft to a complete stop keeping the parachute inflated in the jet streams. The aircraft to remain stationary with engines running whilst observations, movie and still photographic records are made of parachute configuration. F. Downey, (Local 2711) of Equipment Design to be notified when test is being made.

4. DATA REQUIRED

4.1 Photographic records of landing as specified in 3.1 and 3.2.

4.2 Wind conditions - strength, direction and crosswind component.

4.3 Pilot's comments on behaviour of parachute.

R.F.T. PREPARED BY: [illegible]	APPROVED BY:	AUTHORIZED BY: [signature]
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

S/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 2242/01/J
Date July 16, 1958
To S. E. Harper
From T. Roberts
Subject LANDING GEAR TESTS - ARROW 1

Please note that the Landing Gear Tests requested in R.F.T. 07-5054, and Parachute Deployment Loads R.F.T. 5034, Add. 1, are to be carried out on A/C 25204 instead of A/C 25202.

The above R.F.T.'s should be amended accordingly.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

Project Approval

/b

c.c.
Messrs R.N. Lindley
J. Chamberlin
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C.V. Lindow
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J. Scott
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J. Lynch
J. Booth
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S/L Armstrong

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AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 2243/01/J
Date July 16, 1958
To S. E. Harper
From T. Roberts
Subject TESTING OF THE D-HG32A-1 AIR DATA COMPUTER

Herewith R.F.T. 07-5072 specifing the testing required on the above computer to be carried out on A/C 25204. This was discussed at a meeting with R.C.A. but has yet to receive their final approval.

T. Roberts

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.
Messrs R.N. Lindley
J. Chamberlin
C.V. Lindow
F. Brame
F.P. Mitchell
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J. Ames
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J. Lynch
C. Marshall
J. Booth
S. Kwiatkowski
J. Lucas
J. Housego
J. Gale
G. Handforth
A. Mathison

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REQUISITION FOR FLIGHT TEST

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R.F.T. NO. 07-5072

SHEET NO. 1 OF 4

DATE: July 15, 1958

AIRCRAFT 25204	ASSIGNMENT NO. X73-4146	WORK ORDER NO.

TESTING OF THE D-HG32A-1 AIR DATA COMPUTER

1. OBJECTIVE

The purpose of this test is to insure that the outputs of the ADC will be stable and continuous throughout the limited flight envelope of the Arrow available at the time of testing. The further purpose is to accomplish this testing before the ADC outputs are required for the Astra Development programme.

2. EQUIPMENT

A complete ADC system should be used including supporting rack, temperature probe and ADC. This will be the unit serial number 2 and will be available for the period October 1958 to March 1959. The unit should be mounted in its normal position, i.e. inverted, and preferably in its assigned position in the electronics bay.

3. INSTRUMENTATION

3.1 Oscillograph

3.1.1 Aircraft Inputs

1. Aircraft static pressure - full range
2. Aircraft static pressure - intermediate range
3. Aircraft static pressure - low range
4. Differential pressure - full range
5. Differential pressure - intermediate range
6. Differential pressure - low range.
7. Free air total temperature.
8. Roll rate
9. Pitch rate
10. Yaw rate
11. Longitudinal acceleration
12. Lateral acceleration
13. Normal acceleration

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED
SECRET

R.F.T. NO. 07-5072

SHEET NO. 2 OF 4

DATE: July 15, 1958

AIRCRAFT 25204	ASSIGNMENT NO. X73-4146	WORK ORDER NO.

3.1.2 ADC Outputs

1. Mach number
2. Log of static pressure.
3. Altitude
4. Static pressure.
5. Air density
6. Total temperature
7. True airspeed
8. Angle of attack
9. Mach rate
10. Altitude rate

3.2 Photo Panel

1. Airspeed
2. Altitude
3. Mach number
4. Time

4. TEST PROCEDURE AND CONDITIONS

4.1 Test Procedure

Method 3 as given in RCA document AEL No.61 will be used, i.e. special ADC flights will be carried out on the above aircraft. Testing will consist of flying at the conditions listed in 4.2 for the specified manoeuvres and recording the items listed under section 3.

4.2 Test Conditions

4.2.1 At M = 0.7 at 20,000 ft.

4.2.1.1 Fly straight and level

4.2.1.2 Increase aircraft attitude in three distinct steps holding each attitude for approx 10 secs at M = 0.7, then return to initial test altitude.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED
SECRET

R.F.T. NO. 07-5072

SHEET NO. 3 OF 4

DATE: July 15, 1958

AIRCRAFT 25204	ASSIGNMENT NO. X73-4146	WORK ORDER NO.

4.2.1.3 Roll the aircraft to both port and stbd. and maintain 15°, 30° and 45° of roll for approx. 10 secs.

4.2.1.4 Carry out snap-up manoeuvre pulling up to +3 g until approx. 30° angle of climb is attained, then return to initial test altitude

4.2.1.5 Carry out pitch and roll oscillations, amplitude and frequency at pilot's discretion within any aircraft limitations that may exist at time of test.

4.2.1.6 Carry out constant 2 g turn, maintain constant g for approx. 30 seconds.

4.2.1.7 Repeat for constant 3 g turn.

4.2.1.8 Decelerate to minimum safe flying speed, approx. 150 kts. EAS, to obtain recordings at high values of angle of attack.

4.2.2 Accelerate to M = 0.92 and climb at constant Mach number to 36,000 ft.

4.2.3 Repeat tests 4.2.1.1 to 4.2.1.7 inclusive, where final conditions of 4.2.2. are initial test altitude.

4.2.4 Accelerate to M = 1.5 at 36,000 ft.

4.2.5 Repeat tests 4.2.1.1 to 4.2.1.6 inclusive, where final conditions of 4.2.4 are initial test altitude.

4.2.6 Climb at M = 1.5 const. to 50,000 ft.

4.2.7 Repeat tests 4.2.1.1 to 4.2.1.5 inclusive, where final conditions of 4.2.6 are intial test altitude.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

UNCLASSIFIED

SECRET

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5072

SHEET NO. 4 OF 4

DATE: July 15, 1958

AIRCRAFT 25204	ASSIGNMENT NO. X73-4146	WORK ORDER NO.

4.2.7.1 Carry out constant g turn at M = 1.5 and 50,000 ft. at max power limited g, approx. 1.1 g.

4.2.7.2 Carry out constant 2 g turn maintaining constant altitude.

4.2.8 Descend to 40,000 ft. and decelerate to M = 0.92.

4.2.9 Decelerate and descend to circuit height.

4.2.10 Approach and land.

5. DATA

Continuous trace and film records of quantities listed under section 3 for all the test conditions of 4.2.1 to 4.2.10. At least two complete sets of recordings are required, one for Technical Design, the other for transmittal to R.C.A.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 1722/07/J
Date June 27, 1958
To S. E. Harper
From T. Roberts
Subject FLYING CONTROL DEVELOPMENT TESTING

Herewith R.F.T. 5070 covering tests required on A/C 25202 for the first series of flights with 3 axis damping.

These tests are intended to cover the period when only 12 channels of telemetry are available.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

/b

c.c.
Messrs R.N. Lindley
J. Chamberlin
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F.H. Brame
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J. Lynch
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED
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R.F.T. NO. 07- 5070

SHEET NO. 1 OF 4

DATE: June 27, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-383	WORK ORDER NO.

FLYING CONTROL DEVELOPMENT TESTING

1. OBJECTIVE

To assess the behaviour of the 3 axis damper.

2. INSTRUMENTATION

	Item Ref.
2.1 Telemetry	
1. Angle of attack	15-006
2. Angle of sideslip	15-010
3. Normal acceleration - near C.G.	15-020
4. Roll rate	15-018
5. Port elevator angle - full range	15-001
6. Port aileron angle - full range	15-003
7. Rudder angle -full range	15-005
8. Port aileron differential servo position	15-048
9. Port elevator differential servo position	15-046
2.2 Structural Integrity	
10. Vibration pick-up accelerometer No. 42	
11. Vibration pick-up accelerometer No. 58	
12. Vibration pick-up accelerometer No. 38	

Accelerometer nos. are as in fig. 5 of C105 Instrumentation, Issue 7.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

UNCLASSIFIED SECRET

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5070

SHEET NO. 2 OF 4

DATE: June 27, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-383	WORK ORDER NO.

3. TEST PROCEDURE

3.1 Flight conditions should be attained with dampers off except at Mach nos. greater than 1.6 above 40,000'. At each condition pilot to assess aircraft handling with dampers OFF, in yaw roll and pitch, before engaging damper.

After engaging the following damper modes in straight and level flight, assess aircraft handling with damper engaged by gentle movement of controls, followed by abrupt movement of controls. Aircraft response to be within incremental 1 g normal acceleration, acceleration, 30°/sec roll rate and 20% limiting .

Where indicated, the "step input" in the Normal Yaw Damper differential servo should be used to produce a rudder "step" of approximately 1 sec duration or where roll axis damper engaged, until roll angle becomes 45°, to give sideslip within 20% limiting as shown in 71/FAR/23. Step control settings to be given in pilot briefings, these to be obtained from S. Kwiatkowski.

3.2 Yaw Axis only.

3.2.1 Engage Normal (gear up) and assess. Apply step input.

3.2.2 Engage Normal (gear down and assess. Apply step input.

3.2.3 Engage Emergency (gear up) and assess.

3.2.4 Engage Emergency (gear down) and assess.

3.3 Yaw and Pitch Axes together.

3.3.1 Engage Normal (gear up) and assess. Apply step input.

3.3.2 Engage Normal (gear down) and assess. Apply step input.

3.3.3 Tap control stick to excite elevators.

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REQUISITION FOR FLIGHT TEST

UNCLASSIFIED

R.F.T. NO. 07-5070

SHEET NO. 3 OF 4

DATE: June 27, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-383	WORK ORDER NO.

3.4 Yaw and Roll Axis together.

3.4.1 Engage Normal (gear up) and assess. Apply step input.

3.4.2 Engage Normal (gear down) and assess. Apply step input.

3.4.3 Tap control stick to excite ailerons.

3.5 Yaw, Roll and Pitch Axis together.

3.5.1 Engage Normal (gear up) and assess. Apply step input.

3.5.2 Engage Normal (gear down) and assess. Apply step input.

NOTE:- All take-offs should be with dampers off.

4. TEST CONDITIONS

4.1 At 20,000' and M = 0.7 carry out items 3.2 to 3.5 inclusive.

4.2 At 10,000' at 400 kts. EAS perform items 3.2.1, 3.2.3, 3.3.1, 3.3.3, 3.4.1, 3.4.3, and 3.5.1. Carry out wileron and elevator stick taps and rudder kicks, dampers off.

4.3 At 10,000' at 450 kts. repeat as for 4.2.

4.4 At 10,000' at 500 kts. repeat as for 4.2.

4.5 At 50,000' and M = 1.5 repeat 4.1, and control taps as in 4.2.

4.6 At 50,000' and M = 1.4 repeat 4.2.

4.7 At 50,000' and M = 1.6 repeat 4.2.

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R.F.T. NO. 07-5070

SHEET NO. 4 OF 4

DATE: June 27, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-383	WORK ORDER NO.

5. DATA

5.1 Sanborn records of parameters listed in 2.

5.2 Pilot's comments.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 2988/07/J
Date August 21, 1958
To Mr. S. E. Harper
From T. Roberts
Subject FLYING CONTROL DEVELOPMENT TESTING

Herewith R.F.T. 07-5070, Add. 3, stipulating requirements for the 2nd flight of A/C 25202, with yaw and roll damper activated.

T. Roberts

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.
Messrs R.N. Lindley
J.A. Chamberlin
C.V. Lindow
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W/C G. Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen, C.E.P.E., Detachment.

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5070 Add. 3

SHEET NO. 1 OF 3

DATE: Aug. 20, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-383	WORK ORDER NO.

FLYING CONTROL DEVELOPMENT TESTING

The following testing is required on the next flight of A/C 25202 and with yaw and roll damper activated.

1. OBJECTIVE

1.1 Assess normal and emergency yaw damper.

1.2 Assess normal roll damper.

1.3 Carry out control surface taps proceeding in systematic steps to higher EAS.

2. INSTRUMENTATION

2.1 Telemetry

2.1.1 Stability and Control

1. Angle of attack
2. Angle of sideslip
3. Normal acceleration - near C.G.
4. Lateral acceleration - near C.G.
5. Roll rate
6. Port elevator angle - full range
7. Port aileron angle - full range
8. Rudder angle - full range
9. Port aileron differential servo position.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
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REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5070 Add. 3

SHEET NO. 2 OF 3

DATE: Aug. 20, 1958

AIRCRAFT 25202	ASSIGNMENT NO.	WORK ORDER NO.

2.1.2 Structural Integrity

10. Rudder vibration pick-up accelerometer No. 58

11. Elevator vibration pick-up accelerometer No. 38.

Accelerometer nos. are as in fig. 5 of C105 Instrumentation, Issue 7.

3. TEST PROCEDURE

3.1 After engaging the following damper modes in straight and level flight assess aircraft handling with damper engaged by gentle movements of controls.

With yaw damper only engaged a rudder step input should be used, where indicated, for approximately 1 second.

With yaw and roll damper engaged rudder and aileron steps should be applied individually where indicated. The angle of bank should not exceed 45°.

3.2 Yaw Axis only

3.2.1 Engage Normal (gear up)and assess. Apply step input.

3.2.2 Engage Normal (gear down)and assess. Apply step input.

3.2.3 Engage Emergency (gear up) and assess.

3.2.4 Engage Emergency (gear down) and assess.

3.2.5 Carry out control stick taps and rudder kicks with dampers off.

3.3 Yaw and Roll Axis together

3.3.1 Engage Normal (gear up) and assess. Apply step input.

NOTE:- All take-offs should be with dampers off.

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REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5070 Add. 3

SHEET NO. 3 OF 3

DATE: Aug. 20,

AIRCRAFT 25202	ASSIGNMENT NO. X73-383	WORK ORDER NO.

4. TEST CONDITIONS

Test to be carried out in the following order.

4.1 At 20,000' and T.M.N. = 0.7 carry out item 3.2 only.

4.2 At 50,000' (or max. practical altitude) and T.M.N. = 1.2 carry out items 3.2 and 3.3.

4.3 Repeat 4.2 at 50,000' and T.M.N. = 1.3.

4.4 Repeat 4.2 at 50,000' and T.M.N. = 1.4.

4.5 Repeat item 3.2 only at 50,000' and T.M.N. = 1.6.

4.6 At 20,000' and T.M.N. = 0.7 carry out item 3.3 subject to confirmation by Operations Controller.

4.7 At 20,000' with dampers off carry out control stick taps and rudder kicks increasing speed in increments of 0.05 M.N. up to a T.M.N. = 0.95.

5. DATA

5.1 Sanborn records of parameters listed in 2.

5.2 Pilots comments.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

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Inter-Departmental Memorandum

S/L Armshaw
This doesn't leave much for the F.T. Section to do does it. This is a play by play of what is to be done
Ken.

Ref 3353/07/J
Date September 2, 1958
To Mr. S.E. Harper
From T. Roberts
Subject ARROW 1 - FLYING CONTROL DEVELOPMENT

Herewith R.F.T. 07-5070, Add. 5, covering the testing required on the eighth flight of A/C 25202 with three axes damping activated.

T. Roberts

/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

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REQUISITION FOR FLIGHT TEST

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R.F.T. NO. 07-5070 Add. 5

SHEET NO. 1 OF

DATE: September 2, 1958

AIRCRAFT 25203	ASSIGNMENT X73-383	WORK ORDER NO.

FLYING CONTROL DEVELOPMENT

The following testing is required on the eighth flight of A/C 25202 with three axes damping activated.

1. OBJECTIVES

1.1 Assess normal yaw damper.

1.2 Assess normal roll damper.

1.3 Assess normal pitch damper.

1.4 Extend flight envelope.

1.5 Carry out stick taps and rudder kicks.

2. INSTRUMENTATION

2.1 Telemetry

2.1.1 Stability and Control

1. Angle of sideslip.
2. Normal acceleration - near C.G.
3. Lateral acceleration - near C.G.
4. Roll rate.
5. Port elevator angle - full range.
6. Port aileron angle - full range.
7. Rudder angle - full range.
8. Port aileron differential serov position.
9. Port elevator differential servo position.

2.1.2 Structural Integrity

10. Rudder vibration pick-up accelerometer No 58.
11. Aileron vibration pick-up accelerometer No 42.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

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REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5070 Add. 5

SHEET NO. 2 OF

DATE: September 2, 1958

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AIRCRAFT 25203	ASSIGNMENT X73-383	WORK ORDER NO.

2.1.3 Basic Data

12. Range time.

Numbering of parameters is not meant to signify any order of allocation of telemetry channels

3. TEST PROCEDURE

3.1 Clean Aircraft

3.1.1 Carry out rudder kicks and allow aircraft oscillations to subside unassissted if practical.

3.1.2 Carry out stick taps and rudder kicks in order to record control surfaoe vibration.

3.2 Yaw Axis Damper Only

3.2.1 Engage normal mode gear up and assess handling. Apply step input.

3.2.2 Engage emergency mode gear up and assess handling.

3.2.3 Carry out stick taps and rudder kicks in order to record control surface vibration.

3.3 Roll Axis Damper Only

3.3.1 Engage normal mode gear up and assess handling.

3.3.2 Apply step input.

3.3.3 Carry out steady commands, the angle of bank not to exceed 90°.

3.3.4 Trim aircraft for straight and level flight. Note corrections required to maintain this condition.

3.4 Pitch Axis Damper Only

3.4.1 Engage normal mode gear up and assess handling.

3.4.2 Apply step input.

3.4.3 Carry out steady commands.

3.4.4 Carry out trim checks similar to 3.3.4.

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REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5070 Add. 5

SHEET NO. 3 OF

DATE: September 2, 1958

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AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25202	X73-383	

3.5 Three Axes Damping

3.5.1 Engage normal mode gear up for all three axes and assess handling.

3.5.2 Apply step input for each axis individually allowing aircraft to return to neutral position before proceeding with the next axis.

3.5.3 Carry out steady commands one axis at a time.

3.5.4 Carry out trim checks.

4. TEST CONDITIONS

4.1 Take-off, accelerate and climb to 0.7 TMN at 20,000 ft. with dampers off.

4.2 At 0.7 TMN and 20,000 ft. carry out tests 3.2 to 3.5 inclusive, ommiting test 3.2.3.

4.3 Climb at approx. 0.9 TMN to 36,000 ft., at which altitude accelerate to 1.3 TMN Damper Configuration to be stipulated by Operations. Controller dependent upon results of tests 4.2.

4.4 At 36,000 ft. and 1.3 TMN, (approx. 460 kts. IAS), carry our tests 3.1.1., and 3.1.2 and 3.2.1., then continue acceleration to 500 kts. IAS, (approx. 1.4 TMN).

4.5 At 36,000 ft. and 500 kts. IAS carry out tests 3.2.1 and 3.2.3.

4.6 Climb at 500 kts. IAS until 1.8 TMN is attained, (approx 48,000 ft). During climb at constant IAS carry out tests 3.2.1 and 3.2.3 at 1.5, 1.6, 1.7 and 1.8 TMN.

4.7 Decelerate to 1.4 TMN at 48,000 ft. and carry out tests 3.3. to 3.5 inclusive on instructions from Operations Controller.

NOTE:- Normal yaw damper gear up mode is to be engaged at all times above 1.3 TMN.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

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REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5070 Add. 5

SHEET NO. 4 OF

DATE: September 2, 1958

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AIRCRAFT 25202	ASSIGNMENT X73-383	WORK ORDER NO.

5. DATA

5.1 Sanborn records of parameters listed in 2.

* 5.2 Analogue record of Data Tape parameters.

5.3 Pilot's comments.

* It is appreciated that the data of 5.2 is for system development, nevertheless any useful data thus acquired should be utilized by Technical Design.
- 36 parameters, 10 of which are monitored by telemetry.
- all CM data.
- System not properly calibrated for this flight, but data still good for incremental values (as opposed to absolute values).

- M.S.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

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AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 4231/07/J
Date September 25, 1958
To Mr. S. E. Harper
From T. Roberts
Subject ARROW 1 - FLYING CONTROL DEVELOPMENT

Herewith R.F.T. 07-5070 Add. 6, covering the testing required on the 11th flight of A/C 25202 with three axes damping activated.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

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W/C G. Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen, C.E.P.E. Detachment.

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REQUISITION FOR FLIGHT TEST

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R.F.T. NO. 07-5070 Add. 6

SHEET NO. 1 OF

DATE: September 25, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-383	WORK ORDER NO.

FLYING CONTROL DEVELOPMENT

The following testing is required on the 11th flight of A/C 25202.

1. OBJECTIVES

1.1 To obtain a preliminary assessment of the pitch damper.

1.2 To check behaviour of clean aircraft with low viscous dampers.

1.3 Obtain "high speed camera" records of undercarriage doors.

1.4 Check on cockpit pressure fluctuations.

2. INSTRUMENTATION

2.1 Telemetry

2.1.1 Stability and Control

1. Angle of sideslip
2. Normal acceleration - near C.G.
3. Lateral acceleration - near C.G.
4. Roll rate.
5. Port elevator angle - full range.
6. Port aileron angle - full range.
7. Rudder angle - full range.
8. Port aileron differential servo position
9. Port elevator differential servo position.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

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REQUISITION FOR FLIGHT TEST

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R.F.T. NO. 07-5070 Add. 6

SHEET NO. 2 OF

DATE: September 25, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-383	WORK ORDER NO.

2.1.1 Stability and Control Cont'd

10. Volts output from stick force transducer - roll axis.

2.1.2 Structural Intregrity

11. Elevator vibration pick-up accelerometer No. 38.

2.1.3 Basic Data

12. Range Time.

Numbering of parameters is not meant to signify any order of allocation of telemetry channels.

2.2 Other Instrumentation

1. Pressure aft of navigator's bulkhead as cockpit indication.

2. Hinge box deflection at trailing edge on fuselage.

3. AIRCRAFT CONFIGURATION

3.1 Aircraft fuel load should be approx. 6,000 lb. of fuel per side.

4. TEST PROCEDURE

4.1 Take-off dampers off and climb to M = 0.7 at 20,000 ft. Chase pilot to observe elevator throughout climb.

4.2 At M = 0.7 at 20,000 ft. engage yaw and roll damper, normal gear up mode, assess handling.

4.3 Disengage roll damper and engage yaw and pitch axes. Assess handling, apply steady commands and step inputs. Check aircraft trimming characteristics.

4.4 Climb at approx. 300 kts. EAS to 36,000 ft., disengage pitch axis on completion of climb.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

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R.F.T. NO. 07-5070 Add. 6

SHEET NO. 3 OF

DATE: September 25, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-383	WORK ORDER NO.

4.5 At 36,000 ft. accel. to 1.3 M.N. in increments of 0.1 M.N. Carry out elevator stick taps at each M.N. step in conjunction with operations controller.

4.6 During climb if cockpit pressure fluctuations occur pilot to note aircraft altitude, cabin altitude and any fluctuation in altimeter installed in cockpit giving pressure aft. of navigator's bulkhead.

4.7 On returning to base, lower gear at or below 200 kts. EAS and accelerate to speed at which U/C door vibration occurs, within aircraft limitations. Inform chase plane to take high speed ciné records of doors when vibration occurs.

5. DATA

5.1 Telemetry records of data in 2.

5.2 High speed ciné records of U/C doors.

5.3 Pilot's comments.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

S/L Owen

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Inter-Departmental Memorandum

Ref 7604/07/J
Date November 5, 1958
To Mr. S.E. Harper
From T. Roberts
Subject FLYING CONTROL DEVELOPMENT

Herewith R.F.T. 07-5070, Add. 8, specifying testing requirements on Aircraft 25202 on Flight 21.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

/b

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REQUISITION FOR FLIGHT TEST

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R.F.T. NO. 07-1070 Add. 8

SHEET NO. 1 OF

DATE: November 4, 1958

AIRCRAFT 25202	ASSIGNMENT X73-383	WORK ORDER NO.

FLYING CONTROL DEVELOPMENT

The following testing is required on the next flight of A/C 25202.

1. Objectives

1.1 Assess modified flying controls.

1.2 To extend the flight envelope to M = 2.0.

1.3 To evaluate yaw damper with undercarriage down at low speed.

2. INSTRUMENTATION

2.1 Telemetry

2.1.1 Stability and Control

1. Normal acceleration
2. Lateral acceleration
3. Elevator angle
4. Aileron angle
5. Rudder angle
6. Roll rate
7. Aileron differential servo position
* 8. Elevator differential servo position
9. Voltage output stick force transducer - pitch axis

2.1.2 Structural Integrity

10. Rudder trailing edge acceleration
11. Aileron trailing edge acceleration
12. Elevator trailing edge acceleration

* Superimpose flying control pressure switch signal on this channel

2.2 Data Tape

As many parameters as possible, as listed in memo 1719/02A/J.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

AVRO AIRCRAFT LIMITED

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REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5070 Add. 3

SHEET NO. 2 OF

DATE: November 4, 1958

AIRCRAFT 25202	ASSIGNMENT X73-383	WORK ORDER NO.

3. TEST PROCEDURE

3.1 At 7,500 ft. accelerate normal damper gear up, to 500 kts. EAS, assess handling, pull 'g' in level turn within aircraft limitations. Carry out rudder step inputs, aileron and elevator stick taps, at 500 kts. EAS if possible.

3.2 Climb at M = .88 ind. to 35,000 ft. ind. Carry out elevator stick taps during climb.

3.3 Cruise out from base M = .88 ind. at 35,000 ft. ind. Check emergency damper, engage roll and pitch axes, assess handling and apply elevator step inputs.

3.4 Heading towards base, accelerate and climb to obtain approx. M = 1.5 at 50,000 ft.

3.5 Accelerate at 50,000 ft. at M = 2.0. Note speed and engine conditions at stabilised conditions. During acceleration do not descend below 45,000 ft.

3.6 At approx. 160 to 200 kts. EAS at about 5,000 ft. assess yaw damper gear down with undercarriage down.

4. DATA

4.1 Telemetry records of parameters listed in 2.1

4.2 Data tape records in analog form.

4.3 Pilot's comments.

NOTE:- With the modified flying control system the full elevator deflections for the next flight are -20° and +10°.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

Arrow Team -

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref: 1507/09/J
Date: June 20, 1958
To: S. E. Harper
From: T. Roberts
Subject: POOR MAN'S OPTICAL LANDING AID

Herewith R.F.T. 07-5065 to cover testing of the above landing aid. All CF100 and Arrow aircraft should use this aid whenever possible.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

*b

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MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5065

SHEET NO. 1 OF 1

DATE: June 20, 1958

AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.
all flying aircraft		

ASSESSMENT OF POMOLA (POOR MAN'S OPTICAL LANDING AID)

1. OBJECT

To obtain a qualitative assessment of The Poor Man's Landing Aid.

2. EQUIPMENT

2.1 No aircraft instrumentation is required.

2.2 POMOLA boards are to be installed on runway 32 - 14.

3. PROCEDURE

Pilots will use the pomola boards during landings, for an approach angle agreed to by the Pilots.

4. DATA

Pilot's report.

R.F.T. PREPARED BY: W.C. Etherington	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

S/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref: 9973/05/J
Date: June 6, 1958
To: S. E. Harper
From: T. Roberts
Subject: FUEL QUANTITY CALIBRATION

R.F.T. 5061, covering fuel quantity calibration of aircraft 25201 and 25202 prior to their Ottawa flight, is attached.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

WE:b

c.c.
Messrs C. Lindow
J. Chamberlin
F. Brame
F. Mitchell
P. Martin
D. Scard (6)
J. Lynch
A. Cornish
J. Booth
J. Ames
J. Scott

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W/C G. Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen C.E.F.E. Detachment.

FORM 1749 A

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5061

SHEET NO. 1 OF 1

OATE: June 6, 1958

AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.
25201, 25202		

FUEL QUANTITY CALIBRATION

1. Defuel each aircraft completely (including tank 5).

2. Refuel each side in 200 gallon increments recording the cockpit fuel quantity indicator readings after a 1 minute stabilizing period at each fuel increment.

The information is required for preparation of an accurate error chart prior to Ottawa flight by these two A/C June 14, 1958.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
A. Cornish		
OATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

DEC 12 REC'D

S/L Armstrong

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref: 3005/09/J
Date: August 20, 1958
To: Mr. S. E. Harper
From: T. Roberts
Subject: SLEEVE DEPLOYMENT OF DECELERATION PARACHUTE

R.F.T. 5060, covering testing of sleeve deployment on aircraft 25202, is attached. As noted on the R.F.T., it is expected that the sleeve deployment parachute will be available approximately Sept. 15, 1958

T. Roberts

BT/b

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.,

Messrs	C. Lindow	W/C G. Waterman	
	J. Chamberlin	W/C G. Waterman	(2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen C.E.P.E. Detachment
	F. Brame		
	F. Mitchell		
	P. Martin		
	D. Scard		
	D. Woolley (6)		
	W. Alford	Central Files	
	C. Marshall		
	B. Tennant		
	S. Whiteley		
	J. Ames		
	D. Ridler		
	J. Lynch		
	J. Gale		
	J. Scott		

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5060

SHEET NO. 1 OF 2

DATE: August 20, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-4093	WORK ORDER NO.

SLEEVE DEPLOYMENT OF DECELERATION PARACHUTE

1. OBJECT

To determine if sleeve deployment of the deceleration parachute is superior to the existing system.

2. EQUIPMENT

2.1 Three 24 ft. deceleration parachutes packed for sleeve deployment.

2.2 Two movie cameras - one at 64 frames/second, and the other set at 100 frames/sec.

2.3 Dynamic deployment load as per R.F.T. 5034 and I.D.M. 9671/01/J.

3. PROCEDURE

3.1 Two of the supplied parachutes are to deployed during taxi trials; one during a low speed run (at 110 ± 10 kts), and the other during a high speed run (at 135 ± 10 kts.).

The third chute is to be deployed during a landing immediately after touchdown of the nose wheel (but not at a speed greater than 175 kts).

3.2 Complete two camera movie coverage of each streaming sequence is required.

3.3 The dynamic deployment loads are required for each streaming; these loads are to be plotted against true A/C speed.

3.4 For each streaming wind speed and direction are required at the time of streaming.

R.F.T. PREPARED BY: B. Tennant	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5060

SHEET NO. 2 OF 2

DATE: August 20, 1958

AIRCRAFT 25202	ASSIGNMENT NO.	WORK ORDER NO.

4. DATA

4.1 Results of 3.2, 3.3 and 3.4.

NOTE:- Sleeve type parachute deployment is expected to be available approx. September 15, 1958.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

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REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5059

SHEET NO. 7 OF

DATE: June 9, 1958

AIRCRAFT 25203	ASSIGNMENT NO.	WORK ORDER NO.

6 ~~4~~. DATA

The majority of the results obtained from the tests described above herein will be used as input to a digital computer program which is presently being formulated. Since the Computing Dept. will have to punch a large number of cards from the sheets of data prepared by the film readers, there will be certain requirements to be satisfied with regards to their layout. It is suggested that Flight Test hold a meeting with the Computing Dept. before the photo panel is designed to discuss the layout of these sheets. The instruments on the panel can then be arranged to facilitate film reading.

The frequency with which the instruments in the photo panel are to be read for the various manoeuvres will be specified later.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref: 9822/22/J
Date: June 3, 1958
To: S. E. Harper
From: T. Roberts
Subject: NOSE WHEEL STEERING TEST

R.F.T. No. 5058, covering taxi trials to determine the characteristics of the nose wheel steering system on aircraft 25202, is attached.

T. Roberts

WCE*bb

T. Roberts
Technical Design Coordinator
FLIGHT TEST

c.c.
Messrs C. Lindow
F. Mitchell
P. Martin
D. Scard (6)
J. Lynch
F. Brame
C. Marshall
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J. Scott
J. Booth
J. Ames
J. Gale
W/C G. Waterman
W/C G. Waterman (2) AVRO T.S.D. RCAF
For transmittal to
S/L K. Owne C.E.P.E.
Detachment

W. Harris

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MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

SECRET
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R.F.T. NO. 5058

SHEET NO. 1 OF 3

DATE: June 14th, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-369	WORK ORDER NO.

TAXI-TRIAL EVALUATION OF NOSE WHEEL STEERING SYSTEM CHARACTERISTICS

1. OBJECT

To obtain a Pilot's evaluation of the Electro-Hydraulic Nose Wheel Steering System, for three distinct Rudder Bar Angle vs Nose Wheel Angle steering characteristics, each in conjunction with a chosen system gain, as selected at will by the Pilot.

2. EQUIPMENT

2.1 Arrow 1 Aircraft No. 25202 with Electro-Hydraulic Steering System installation, as per Memo 9572/09/J dated 26 May, 1958.

2.2 Recording equipment as required.

3. PROCEDURE

3.1 General

A qualitative handling assessment should be carried out for the Rudder Bar Angle vs Nose Wheel Angle steering characteristics 1, 2, and 3, used in conjunction with the following recommended values of system gain:- 100, 50, and 30% maximum gain.

The taxi speeds used in the trials, should be up to the maximum considered feasible by the Pilot, for each particular System Gain/Steering Characteristic (SG/SC) combination.

It is a definite aim of the evaluation, to attempt steering up to high a/c speeds, and at the higher speeds, say above 60 knots, steering characteristics 1 or 2 in conjunction with 100% - 50% System Gain should be suitable. However, if steering is to be used at low a/c speeds only, say below 60 knots, characteristic 3 in conjunction with 100% - 50% System Gain may prove acceptable.

R.F.T. PREPARED BY: W. Harris, J.E. Smith	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

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R.F.T. NO. 5058

SHEET NO. 2 OF 3

DATE: June 14th, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-369	WORK ORDER NO.

3. PROCEDURE

3.1 General Cont'd.

It is considered that the initial evaluation 3.2.1 will prove the SG/SC combinations using 30% System Gain to be unacceptable, due to sluggish system response, with the consequent tendency to over-steer.

SG/SC combinations with 30% System Gain are therefore not called for in 3.2.2 - 3.2.5.

3.2 Test Configurations

3.2.1 Examination of general manoeuvrability at low a/c speeds (say up to 40 knots) for all SG/SC combinations.

3.2.2 Steering a straight course up to maximum a/c ground speed.
Recommended SG/SC:- 100% - 50% gain
Charact. 1 or 2

3.2.3 Steering round various turning radii.
Recommended SG/SC:- 100% - 50% gain
Characts. 1, 2 or 3

3.2.4 Steering a number of S-turns with continuous acceleration of the a/c up to high a/c speed.
Recommended SG/SC:- 100% - 50% gain
Characts. 1 or 2

3.2.5 The above tests 3.2.1 - 4 repeated for a number of different runway conditions.

R.F.T. PREPARED BY: W. Harris, J.E. Smith	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED

R.F.T. NO. 5058

SHEET NO. 3 OF 3

DATE: June 14th, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-369	WORK ORDER NO.

3.3 Recordings

Continuous recordings should be made of:-

3.3.1 Rudder Bar Angle.

3.3.2 Nose Wheel Angle.

3.3.3 Steering Jack differential pressure.

3.3.4 Steering engagement and disengagement.

3.3.5 Pilot's commentary.

4. DATA REQUIRED

4.1 Pilots handling assessment report.

4.2 Oscillographs of 3.3.1, 3.3.2, 3.3.3, and 3.3.4.

4.3 Recording of Pilot's commentary.

5. REMARKS

It is considered that in Test Configuration 3.2.1 the SG/SG combinations using 10% and 30% gains, may prove unacceptable, due to sluggish system response.

Should this prove to be the case, the 10% and 30% gain SG/SG combinations may be omitted in 3.2.2, 3.2.3, 3.2.4, and 3.2.5.

R.F.T. PREPARED BY: W. Harris, J.E. Smith	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref: 9821/22/J
Date: June 3, 1958
To: S. E. Harper
From: T. Roberts
Subject: SNIFFER TESTS

R.F.T. No. 5057, covering sniffer tests to be carried out on aircraft 25202, is attached.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

WCE*bb

c.c.
Messrs C. Lindow
F. Mitchell
P. Martin
D. Scard (6)
J. Lynch
F. Brame
C. Marshall
D. Royston
J. Booth
D. Rogers
J. Scott
J. Ames
J. Gale
W/C G. Waterman
W/C G. Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen C.F.P.E. Detachment.

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5057

SHEET NO. 1 OF 1

DATE: June 3, 1958

AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.
25202	X73-4069	

SNIFFER TESTS

1. OBJECT

To test for the presence of explosive gas concentrations in various compartments in the aircraft.

2. EQUIPMENT

2.1 One sniffer to be installed as a reference.

2.2 Nine sniffers to be installed in the dead spots shown on drawings (707-50-5 shts. 1 & 2) which have been supplied to Flight Test.

3. PROCEDURE

Recordings are to be made of all aniffers for six flights. The data obtained will then be analyzed with a view to relocating the sniffers for subsequent flights.

R.F.T. PREPARED BY: W. Etherington	APPROVED BY: B.J. Monhull	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

3/c Armstrong
We are after the Co on this matter. This RFT came out too late. Such request should come before A/c #4 line.
K.J.P.

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref: 9021/11/J
Date: May 13, 1958
To: S. E. Harper
From: T. Roberts
Subject: ARROW 1 - AIRCRAFT WEIGHING

Attached herewith is R.F.T. 5056, which covers the R.C.A.F. requirements for Weight and Balance and, to establish basic balance information on the Arrow 1.

T. Roberts

EB:bb

T. Roberts
Technical Flight
Test Co-ordinator

c.c.
Messrs J. Chamberlin
F. Brame
C. Lindow
F. Mitchell
P. Martin
C. Marshall
D. Scard (6)
J. Lynch
E. Burnett
A. Cornish
J. Gale
J. Booth
J. Ames
J. Scott
D. Rogers

W/C G. Waterman
W/C G. Waterman (2) T.S.D. AVRO.RCAF for transmittal to S/L K. Owen C.E.P.E.

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5056

SHEET NO. 1 OF

DATE: May 13, 1958

AIRCRAFT 25201	ASSIGNMENT NO.	WORK ORDER NO.

ARROW 1 - AIRCRAFT WEIGHING

PURPOSE OF TEST

1. To satisfy R.C.A.F. requirements for Weight and Balance as called up in CAP 479, Chap. 30.03 (5) i.e. Aircraft Weighed in "Dry" Condition.

2. To establish basic balance information (i.e. (1) Empty Weight (2) Trapped Fuel (3) Residual Fuel (4) Unmeasurable usable fuel), in order to eliminate Aircraft weighing before each flight.

1 METHOD

Calibrate fuel gauge system:-

Weigh A/C in "dry" condition in 7° tail down attitude. Weigh A/C in level attitude. From results calculate Horizontal and Vertical Components of C.G.

2 METHOD

Put quantity of fuel in tanks and run system to ensure all lines full of fuel. Drain A/C in normal ground attitude through drain valves. Weigh aircraft in level attitude and establish Empty Weight.

Place a quantity of fuel in each tank and remove through normal operating fuel system. Drain and measure quantity of fuel from each tank and establish residual fuel quantity.

Add fuel to each tank individually, recording quantity of fuel added at which the Field Tester indicates the addition of added capacitance. This fuel is usable but not measurable.

Further details may be obtained from E. Burnett, Weights Dept, and A. Cornish, Technical Design.

R.F.T. PREPARED BY:	APPROVED BY: E.F. Burnett	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

26 May 58

9 Jun

BOT 6491 -424

(2) S/L Armstrong
This looks O.K within our knowledge of the problem. Perhaps Walt could shed more light
W.Wfd.

AVRO AIRCRAFT LTD.

Inter-Departmental Memorandum

(1)
Ref: 8964/09/J
Date: May 12, 1958
To: S. E. Harper
From: T. Roberts
Subject: ENERGY ABSORBED BY LANDING GEAR DURING LANDING

Herewith the subject R.F.T. No. 5054. The tests are to be carried out on the second Arrow 1 aircraft No. 25202 after its first flight.

DM*bb

T. Roberts
Technical Flight
Test Co-ordinator

c.c.
Messrs R. Lindley
J. Chamberlin
F. Brame
C. Lindow
F. Mitchell
P. Martin
D. Scard (6)
J. Ames
W. Alford
R. Wade
J. Booth
J. Lynch
J. Gale

W/C G. Waterman
W/C G. Waterman (2) T.S.D. AVRO RCAF for transmittal to S/L K. Owen C.E.P.E. Detachment

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(3) AW-1 - Could we have your comments on min (1) please. (RFT # 5054)
Lew Armstrong S/L
AT-1
26 May 58

(4) AT-1
Will brief you on this because there are several points which AVRO failed to comment on.
W.M. McLeod
AW-1
9 Jun

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5054

SHEET NO. 1 OF

DATE: May 12, 1958

AIRCRAFT 25202	ASSIGNMENT NO.	WORK ORDER NO.

ENERGY ABSORBED BY LANDING GEAR DURING LANDING

1. OBJECT

In design of the landing gear the energy absorbed by wing deflection during landing was ignored, and it is the object of this test to measure the actual energy absorbed by the landing gear in an attempt to increase the permissible landing weight.

2. INSTRUMENTATION

2.1 Oscillograph recording will be required of the following:-

2.1.1 Strain gauges placed on the main undercarriage leg, the side stay and the back stay of both port and starboard legs. Six gauges are required at each section, making thirty six measurements in all. The exact location of the strain gauges and any other pertinent information, such as scaling on the oscillograph, may be obtained from the Stress Office.

2.1.2 Fore and Aft. leg acceleration - port and starboard (Reference numbers 31-016 and 31-017).

2.1.3 Normal acceleration at the aircraft C.G.

2.1.4 Normal acceleration at the undercarriage attachment to the wing - port and starboard.

2.1.5 Normal acceleration at each wing tip (Reference number 10-034, 10-035 or 10-036 port, and 10-020, 10-021 or 10-022 starboard).

2.2 Velocity of descent. The method of determination of this parameter should ideally give an accuracy of ∓ 0.1 ft/sec, but in any case it should not be worse than ∓ 0.3 ft/sec. This problem is being investigated by Flight Test Dept.

R.F.T. PREPARED BY:	APPROVED BY: R Boole	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5054

SHEET NO. 2 OF 2

OATE: May 12, 1958

AIRCRAFT 25202	ASSIGNMENT NO.	WORK OROER NO.

2.3 Speed and ground angle at touch down. Photographic coverage from the side of the runway will be satisfactory.

2.4 It will be necessary to know the aircraft weight, C.G. position, ambient pressure, temperature and wind velocity during the landing.

2.5 A reasonably accurate determination of the oleo movement of each leg must be possible from an aircraft mounted camera.

3. PROCEDURE

A minimum of three landings should be made. These may be made at normal weights and descent rates. If it is found that conditions are widely different for the three landings made, some further instrumentated landing may be requested.

4. DATA

As listed under 2.0.

R.F.T. PREPAREO BY:	APPROVEO BY:	AUTHORIZEO BY:
OATE FOR COMPLETION	PRIORITY	ESTIMATEO COMPLETION OATE:

FORM 1749 A

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 8863/09/J
Date December 22, 1958
To Mr. S. E. Harper
From T. Roberts
Subject LANDING GEAR TESTS - ARROW 1

Herewith addendum number 1 to R.F.T. No. 07-5054.

The number of changes from the original issue of the R.F.T. are such that it was considered best to rewrite it completely. This addendum therefore supercedes and cancels the original issue of the subject R.F.T.

The tests are now planned to be performed on aircraft 25205.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

/b

c.c.
Messrs R. Lindley
J. Chamberlin
F. Brame
C. Lindow
F. Mitchell
T. Higgins
J. Ames
D. Scard
J. Lynch
J. Hodge
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B. Alford
R. Wade
H. Shoji
W/C G. Waterman
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FORM 1749 A

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5054 Add. 1

SHEET NO. 1 OF

DATE: December 22, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25205	X74-4009	

LANDING GEAR TESTS - ARROW 1

1. OBJECTIVES

The Stress Dept. desire to achieve the following by means of these tests.

(a) The check their dynamic analysis.

(b) To obtain a loading spectrum for both landing and taxying conditions.

(c) To correlate ground reactions during landing.

2. INSTRUMENTATION

2.1 A total of 34 strain gauges is required, 20 on the port side and 14 on the starboard. Of these, one set of 6 gauges on each side is wired in series and averaged, thus giving 15 measurements required on the port side 9 on the starboard. These 24 quantities are to be recorded by means of an oscillograph (preferably two). The exact location of the strain gauges and any other pertinent information should be obtained from the Stress Office.

2.2 Oscillograph recording of port and starboard oleo position.

2.3 The final stage of the descent and the first part of the ground run should be covered by cameras placed close to the runway such that the following may be determined:

(a) Rate of descent.

(b) Pitch angle at touch-down.

(c) Roll angle at touch-down (of secondary importance).

(d) Ground speed.

2.4 Normal acceleration at the C.G.

2.5 Aircraft weight and C.G. position (Pilot read fuel weight will be satisfactory.)

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
D.H.M.	R.P.Wade	

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5054 Add. 1

SHEET NO. 2 OF 2

DATE: December 22, 1958

AIRCRAFT	ASSIGNMENT	WORK ORDER NO.
25205	X74-4009	

3. PROCEDURE

As many instrumented landings as possible should be made. These may be at normal weights and descent rates.

If and when anti-skid is fitted to the subject aircraft, a few landings should be made with it in use.

4. DATA

As listed under 2.0.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:

FORM 1749 A

S/L Armstrong

1) No comment K.O

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref: 9663/09/J
Date: May 28, 1958
To: S. E. Harper
From: T. Roberts
Subject: BRAKE TESTS

Attached herewith is R.F.T. 5055 which covers tests on modified brake control valves and heavier brakes on the Arrow 1.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

*bb

c.c.
Messrs R. Lindley
J. Chamberlin
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W/C G. Waterman
W/C G. Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L. K. Owen C.E.P.E. Detachment

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

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R.F.T. NO. 5055

SHEET NO. 1 OF 2

DATE: May 21, 1958

REQUISITION FOR FLIGHT TEST

AIRCRAFT 25201	ASSIGNMENT NO. X73-386	WORK ORDER NO.

1. OBJECT

To assess modified brake control valves and heavier brakes (1" thick discs and thinner brake pads).

2. EQUIPMENT

Goodyear brakes - Serial Nos. E-10331
E-101511
E-101611
E-101811

Brake Control Valves (7-1954-281) Serial No. 1013
1021

3. PROCEDURE

Test and assess the brakes as follows:-

3.1 Determine brake pressure as a function of rudder pedal force and deflection prior to taxi trials.

3.2 Taxi the aircraft at speeds up to 50 kts. Assess smoothness of brake operation and record brake temperatures after prolonged taxying (e.g. 2 miles).

3.3 Accelerate to 100 Kts. and brake the aircraft to a full stop without using the parabrake. Aircraft weight = 60,000 lb. (min).

3.4 Accelerate to 120 Kts. and brake the aircraft to a full stop without using the parabrake. Aircraft weight = 60,000 lb. (min).

3.5 Land the aircraft at 165 - 175 kts. and bring the aircraft to a complete stop using brakes and parabrakes. Aircraft weight = 55,000 lb. (max).

R.F.T. PREPARED BY: B. Jewell	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED

R.F.T. NO. 5055

SHEET NO. 2 OF 2

DATE: May 21, 1958

AIRCRAFT 25201	ASSIGNMENT NO. X73-364	WORK ORDER NO.

NOTE:- Items 3.1, 3.2, are required prior to flight. Item 3.3 and Item 3.4 to be programmed at the discretion of the pilot and project designers.

4. DATA REQUIRED

(a) Brake pressure vs rudder pedal deflection and force from static calibration.

(b) Pilot's assessment of handling qualities.

(c) Brake pad temperatures before and after each test.

(d) Maximum wheel rim temperatures (from temperature - sensitive paints).

(e) Test conditions, e.g. Aircraft weight, speed, runway used, weather conditions, braking distances.

R.F.T. PREPARED BY:	APPROVED BY: Da Ridler	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

S/c Armstrong
No comment
K.G.J.

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref: 9328/09/J
Date: May 23, 1958
To: S. E. Harper
From: T. Roberts
Subject: AMMENDMENT TO R.F.T. NO. 5054, ENERGY ABSORBED BY LANDING GEAR DURING LANDING

With reference to paragraph 2.1.1 of the original R.F.T. it will not be necessary to make an individual recording of all thirty six strain gauge readings. The six gauges at each of six sections may be averaged and only these resultant mean values recorded on the oscillograph.

T. Roberts

T. Roberts
Technical Design Coordinator
FLIGHT TEST

DHM*bb

c.c.
Messrs R. Lindley
J. Chamberlin
F. Brame
C. Lindow
F. Mitchell
P. Martin
D. Scard (6)
J. Ames
W. Alford
R. Wade
C. Ditchfield
J. Booth
J. Lynch
J. Gale

W/C G. Waterman
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~~W/C G. Waterman~~
S/L Armstrong.
I don't know anything about this gizmo KO

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref: 8899/01/J
Date: May 8, 1958
To: S. E. Harper
From: T. Roberts
Subject: ENGINEERING PRE-FLIGHT TESTS ON A/C 25201

Attached herewith is R.F.T. No. 5053, which specifies the replacement of the turbine outlet temperature controller for the pneumatic type controller on the Arrow I.

T. Roberts

T. Roberts
Technical Flight
Test Co-ordinator

PI*bb

c.c.
Messrs J. Chamberlin
F. Brame
C. Lindow
C. Marshall
D. Scard '6'
J. Lynch
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P. Martin
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W/C G. Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen C.E.P.E. Detachment

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5053

SHEET NO. 1 OF 1

OATE: May 7, 1958

AIRCRAFT 25201	ASSIGNMENT NO.	WORK OROER NO.

ENGINEERING PRE-FLIGHT TESTS - A/C 25201

1. OBJECT

The turbine outlet temperature controller has been replaced with a pneumatic type controller.

In addition the Hamilton Standard cockpit and radar temperature controllers will be replaced with Avro built controllers as soon as these units are available. (Assignment X73-344).

After the above modifications have been completed the following system checks should be made to prove the functioning of the system.

2. TESTS

2.1 Tests To Be Done After Replacement of Turbine Temperature Controller.

2.1.1 Cockpit Pressurization Tests

Carry out the cockpit pressurization tests as called for in para. 4.1.1. of Report 21/SYSTEMS 22/12-3, Production and Pre-Flight Testing of the Air Condition System.

2.1.2 System Ground Checks (Engines Running)

Carry out all the system checks in para. 4.2 of Report 21/SYSTEMS 22/12-3, Production and Pre-Flight Testing of the Air Conditioning System (Exclude para. 4.2.8.).

2.2 Tests To Be Done After Replacement of Cockpit and Radar Temperature Controllers with Avro Built Units.

Carry out test as called for in para. 4.2.8. of Report 21/SYSTEMS 22/12-3.

R.F.T. PREPARED BY: P. Isaac	APPROVED BY:	AUTHORIZED BY:
OATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION OATE:

UNCLASSIFIED

S/L Armstrong

No - comment - rather a comprehensive job.

[initials]

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref: 9341/22/J
Date: May 23, 1958
To: S. E. Harper
From: T. Roberts
Subject: ARROW 1 - FIRST SERIES OF ENGINEERING FLIGHTS

Attached herewith is R.F.T. 5051, which covers the first series of engineering flights on the Arrow 1.

T. Roberts

T. Roberts
Technical Design Coordinator
FLIGHT TEST

TR*bb

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R. Lindley
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5051

SHEET NO. 1 OF 9

DATE: May 15, 1958

AIRCRAFT 25201	ASSIGNMENT NO. X73-383	WORK ORDER NO.

ARROW 1 - FIRST SERIES OF ENGINEERING FLIGHT

1. OBJECTIVE OF FLIGHTS

The objective of the first series of engineering flight is to obtain data and investigate the following:-

1.1 Free aircraft stability and control derivatives.

1.2 Check yaw damper as altered on the basis of information obtained to-date.

1.3 Check for control surface buzz, particularly in the transonic region.

1.4 Check engine functioning, particularly during subsonic climb and cruise.

1.5 Obtain brake pressures and undercarriage fore and aft accel. during normal landing.

1.6 Check for intake flow break away at reduced R.P.M.

1.7 Check roll and pitch damper, when available.

1.8 Check C_L vs α with undercarriage down, doors shut.

1.9 To probe further the flight envelope within the revised limits of the design certificate.

1.10 To determine the max. level speed, consistent with the flight envelope limitations, prior to changing to the 45" divergent ejector.

The above sequence does not indicate the order in which tests should be conducted.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

UNCLASSIFIED

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5051

SHEET ND. 2 OF 9

DATE: May 15, 1958

AIRCRAFT 25201	ASSIGNMENT ND. X73-383	WORK DRDER ND.

2. DATA REQUIRED FROM TESTS

2.1 Telemetry

2.1.1 Stability and Control

Angle of Attack.
Angle of sideslip.
Normal acceleration.
Lateral acceleration.
Roll rate. p
Pitch rate. q
Rudder differential servo position.
Rudder angle.
Port elevator angle.

2.1.2 Engine Installation

Fuel temperature at inlet to starboard engine burner.

2.1.3 Structural Integrity

(1) Channel for vibration pick-up accelerometer.
(2) Channel for vibration pick-up accelerometer.

Provision should be made such that any two of the following accelerometers could be chosen for a particular flight. These to be stipulated prior to preparing A/C for flight.

Accelerometers nos. 22, 34, 36, 42; 51, 58, 61, and 67. see CF105 Instrumentation, Issue 7, Fig. 5.

2.2 Oscillograph

2.2.1 Stability and Control

Aircraft static pressure.
Differential pressure.
Port elevator differential servo balance.≠

R.F.T. PREPARED BY:	APPRDVED BY:	AUTHDRIZED BY:
DATE FDR COMPLETIDN	PRIDRITY	ESTIMATED COMPLETIDN DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED

R.F.T. NO. 5051

SHEET NO. 3 OF 9

DATE: May 15, 1958

AIRCRAFT 25201	ASSIGNMENT NO. X73-383	WORK ORDER NO.

2.2.1 Stability and Control Cont'd

Port aileron differential servo balance.≠

≠ These items are not required until roll and pitch damper is available.

2.2.2 Damper System

Normal acceleration.	(normal axis)
Lateral acceleration.	(normal axis)
Roll rate.	(normal axis)
Yaw rate.	(normal axis)
Rudder differential servo balance	(normal axis)
Aileron angle.	(normal axis)
Aileron position X pitch rate.	(normal axis)
Yaw emergency differential servo solenoid	(D.C. Signal)

2.2.3 Flying Control Hydraulics

Filter box outlet pressure.	System B*
Port engine pump inlet temperature	System B

* This may not be available for the first series of flights and is being investigated by Flight Test Department.

2.2.4 Engine Installation

Oil temperature at starboard engine inlet.
Fuel mass flow to starboard engine.
Starboard engine L.P. compressor R.P.M.
Starboard turbine discharge pressure.

2.2.5 Fuel System

Fuel temperature at inlet to starboard engine fuel pump.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

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REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5051

SHEET NO. 4 OF 9

DATE: May 15, 1958

AIRCRAFT 25201	ASSIGNMENT NO. X73-383	WORK ORDER NO.

2.2.6 Undercarriage and Brakes

Normal brake pressure (port)
Normal brake pressure (starboard)
Fore and aft leg acceleration (port)
Fore and aft leg acceleration (starboard)

2.2.7 Control Mechanism

Aileron stick force
Aileron stick position

These should be available to be recorded during certain flights in exchange for brake pressures.

2.3 Data Tape

2.3.1 Intake

Massa M141 Microphone on intake outer skin.

The exact location and calibration of item 2.3.1. to be decided by Flight Test Dept. and Stress Office.

2.3.2 Pilot's Voice

The following information is required during engine tests.

Starboard engine H.P. Compressor R.P.M.
Starboard engine J.P.T.
Starboard engine pressure ratio.

2.4 Tufting

Tufting is required on one intake to obtain flow data during engine deceleration at altitude. This should be photographed from the CF100 chase aircraft. The exact location of the tuft to be decided by Flight Test and Technical Design.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

UNCLASSIFIED

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5051

SHEET NO. 5 OF 9

DATE: May 15, 1958

AIRCRAFT 25201	ASSIGNMENT NO. X73-383	WORK ORDER NO.

3. TEST PROCEDURE

3.1 Yaw Damper - and free aircraft damping in pitch to be checked up to 450 kts. EAS at 10,000 ft., this is a repeat of tests performed during the first series of flights, and must be performed on the first flight.

3.2 Engine Behaviour - should be investigated on the first flight of this next series. This should include a fixed throttle climb at 400 kts. EAS until 0.9 M.N. is attained, and then continued at 0.9 M.N. to 36,000 ft., items 2.3.2. being obtained in addition to recorded data. At least one stabilized level speed run should be made at 36,000 ft. at M = 0.9 for 2 or 3 minutes duration.

Tests should be carried out on a flight, possibly about half way through the series, to investigate the intake vibration to low engine R.P.M. This should consist of obtaining photographs of the intake tufts when the engine is throttled back to idling for a series of M.N.'s at approx. 30,000 to 36,000 ft. as discussed with Flight Test. For the same tests, recordings are required from the Massa M141 microphone. This should be in a form suitable for playing through a frequency analyzer.

3.3 Control Surface Taps - should be carried out as in previous tests with particular attention being given to the transonic range. Acceleration to supersonic speeds should start at high altitude, lower altitudes being investigated progressively.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

3.4 Stability & Control

Manoeuvres shown should be performed at the following flight condition. The actual points to be particular flight will depend largely on the results of the previous flight. Flight Test will this by Technical Design prior to their preparation of the Flight Briefing.

ALTITUDE (FT)	MACH NO.	MANOEUVRES
40,000	0.60	3.4.1.1. & 2; 3.4.2.2;
40,000	0.70	3.4.1.1. & 2; 3.4.2.2; 3.4.3;
40,000	0.80	3.4.1.1. & 2; 3.4.2; 3.4.3;
40,000	1.00	3.4.1.1. & 2; 3.4.2; 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2;
40,000	1.15	3.4.1.1. & 2; 3.4.2; 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2; 3.4.4.
40,000	1.30	3.4.2.1; 3.4.1.1;
40,000	1.40	3.4.1.1. & 2; 3.4.2; 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2; 3.4.4.
40,000	1.50	3.4.2.1; 3.4.1.1;
40,000	1.60	3.4.1.1. & 2; 3.4.2; 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2; 3.4.4.
50,000	1.40	3.4.1.1. & 2; 3.4.2; 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2; 3.4.4.
50,000	1.60	3.4.1.1. & 2; 3.4.2; 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2; 3.4.4.
50,000	1.15	3.4.1.1. & 2; 3.4.2; 3.4.3;
50,000	1.00	3.4.1.1. & 2; 3.4.2; 3.4.3;
50,000	0.80	3.4.1.1. & 2; 3.4.2.2; 3.4.3;
30,000	0.95	3.4.1. to 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2; 3.4.4.
30,000	0.80	3.4.1.1. & 2; 3.4.2; 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2;
30,000	0.60	3.4.1.1. & 2; 3.4.2; 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2;
30,000	0.45	3.4.1.1. & 2; 3.4.2.2;
20,000	0.40	3.4.1. to 3.4.3;
20,000	0.70	3.4.1. to 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2; 3.4.4.
20,000	0.90	3.4.1.1. & 2; 3.4.2; 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2; 3.4.4.
10,000	0.40	3.4.1. to 3.4.3;
10,000	0.70	3.4.1.1. & 2; 3.4.2; 3.4.3; 3.4.4.1. to 3; 3.4.5.1. & 2; 3.4.4.
10,000	0.80	3.4.2.1; 3.4.1.1;

NOTE:- Pilot should depress calibrate switch at start and finish of each set of manoeuvres; vi finish of 3.4.1., of 3.4.2. etc. at each flight condition.

following flight condition. The actual points to be tested in any
e results of the previous flight. Flight Test will be informed of
paration of the Flight Briefing.

MANOEUVRES

.2.2;				
.2.2; 3.4.3;				
.2; 3.4.3;				
.2; 3.4.3;	3.4.4.1. to 3; 3.4.5.1. & 2;			
.2; 3.4.3;	3.4.4.1. to 3; 3.4.5.1. & 2;	3.4.4.4; 3.4.5.3;		
.2; 3.4.3;	3.4.4.1. to 3; 3.4.5.1. & 2;	3.4.4.4; 3.4.5.3;		
.2; 3.4.3;	3.4.4.1. to 3; 3.4.5.1. & 2;	3.4.4.4; 3.4.5.3;		
.2; 3.4.3;	3.4.4.1. to 3; 3.4.5.1. & 2;	3.4.4.4; 3.4.5.3;	3.4.6;	
.2; 3.4.3;	3.4.4.1. to 3; 3.4.5.1. & 2;	3.4.4.4; 3.4.5.3;	3.4.6;	
.2; 3.4.3;			3.4.6;	
.2; 3.4.3;			3.4.6;	
.2.2; 3.4.3;				
	3.4.4.1. to 3; 3.4.5.1. & 2;	3.4.4.4; 3.4.5.3;		
.2; 3.4.3;	3.4.4.1. to 3; 3.4.5.1. & 2;		3.4.6;	
.2; 3.4.3;	3.4.4.1. to 3; 3.4.5.1. & 2;			
.2.2;			3.4.6;	
	3.4.4.1. to 3; 3.4.5.1. & 2;	3.4.4.4; 3.4.5.3;		
.2; 3.4.3;	3.4.4.1. to 3; 3.4.5.1. & 2;	3.4.4.4; 3.4.5.3;		
			3.4.6; (includes part of 3.1)	
.2; 3.4.3;	3.4.4.1. to 3; 3.4.5.1. & 2;	3.4.4.4; 3.4.5.3;	3.4.6; (includes part of 3.1)	

ch at start and finish of each set of manoeuvres; viz. at start and
each flight condition.

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED

R.F.T. NO. 5051

SHEET NO. 7 OF 9

DATE: May 15, 1958

AIRCRAFT 25201	ASSIGNMENT NO. X73-383	WORK ORDER NO.

3.4.1 Dampers Off - Level Flight

3.4.1.1 Apply steady sideslip up to 20% of limit sideslip (values of limit sideslip to be supplied) and hold wings level. Release rudder and aileron, allow oscillations to subside.

3.4.1.2 Without touching stick after trimming, apply a moderately sudden sideslip (see below) with rudder only, and release. Allow oscillations to subside.

(a) Up to 20% limit sideslip.
(b) Up to 40% limit sideslip.

3.4.1.3 Where damper steady oscillation of 1 cps has been noticed, apply a sideslip at the low speed condition, increasing from $\beta = 0^\circ$ to $\beta = +4^\circ$ and back through $\beta = 0^\circ$ back to $\beta = -4^\circ$. Hold wings level with aileron.

3.4.2 Normal Yaw Damper Engaged - Level Flight.

3.4.2.1 Start from trimmed flight. Deflect stick back to produce + 1g to +1.5g incremental, then return to neutral and release. Allow oscillations to subside.

3.4.2.2 Apply step input to produce the following and return.

(a) 20% limit β
(b) 40% limit β

3.4.3 Roll - Yaw Damper Engaged

3.4.3.1 Roll from $\phi = -45^\circ$ to $\phi = +45^\circ$ and back at a rate not exceeding 50°/sec.

Note In 3.4.3.1. attempt to achieve steady rate of roll as soon as possible, and hold ailerons steady at this roll rate for as long as possible.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

~~SECRET~~ UNCLASSIFIED

R.F.T. NO. 5051

SHEET NO. 8 OF 9

OATE: May 15, 1958

AIRCRAFT 25201	ASSIGNMENT NO. X73-383	WORK OROER NO.

3.4.4. Normal Yaw - Damper Engaged

3.4.4.1 Trim into turn pulling 2g at const. M.

3.4.4.2 Repeat 3.4.2.1. but limit Δn to 1g.

3.4.4.3 Apply rudder step input.

(a) to 20% limit β
(b) to 40% limit β

3.4.4.4 Trim into 3g turn and repeat 3.4.4.3. (a).

3.4.5. Dampers Off - Accelerated Flight

3.4.5.1 Trim into turn pulling 2g, const. Mach No.

3.4.5.2(a) Without touching stick, deflect rudder to produce 20% limit β and release.

(b) If resultant roll was not excessive, repeat with 30% limit β.

3.4.5.3 Repeat 3.4.5.2(a) pulling 3g.

3.4.6. Dampers Off Trimmability (at a limited number of conditions)

3.4.6.1 Apply rudder steadily up to 40% limit β with trim at a steady rate, holding wings level with aileron. Return with trim to $\beta = 0^{o}$, holding wings level.

3.4.6.2 Apply aileron trim holding wings level with rudder, up to 40% limit β, and return trim to zero taking off sideslip with rudder.

3.4.6.3 Apply elevator trim to produce $\Delta n = 1g$ and remove trim, at a steady rate.

R.F.T. PREPAREO BY:	APPROVED BY:	AUTHORIZED BY:
OATE FOR COMPLETION	PRIORITY	ESTIMATEO COMPLETION OATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED

R.F.T. NO. 5051

SHEET NO. 9 OF 9

DATE: May 15, 1958

AIRCRAFT 25201	ASSIGNMENT NO. X73-383	WORK ORDER NO.

3.4.7 Investigation of the three axes normal damper (if available).

3.4.7.1 In a specified flight condition engage pitch axis and assess handling.

3.4.7.2 Repeat of 3.4.7.1 for roll axis.

3.4.7.3 Engage all 3 axes and assess handling.

3.4.8 At least one landing at the Pilot's discretion should be made with damper off during this series of flights.

3.5 Photographs of the aircraft against the horizon should be obtained over a range of speeds such that C_L vs α can be determined. This is required with the undercarriage down but with the doors shut. This means the undercarriage can not be retracted during these flights. The final approach and landing should be photographed as usual. The object of this test is to determine the change in C_L vs α with the undercarriage doors shut.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

UNCLASSIFIED

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 8259/03/J
Date April 18, 1958
To S. E. Harper
From T. Roberts
Subject ARMAMENT PACK SEAL TESTS

R.F.T. 5050, covering Armament Pack Seal Tests on aircraft 25203 with and without Sparrow missiles, is attached.

T. Roberts

WE*bb

T. Roberts
Technical Flight
Test Co-ordinator

c.c.
Messrs J. Chamberlin
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For transmittal to
S/L K. Owen, C.E.P.E.
Detachment.

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED

R.F.T. NO. 5050

SHEET NO. 1 OF

OATE: April 18, 1958

AIRCRAFT 25203	ASSIGNMENT NO. X73-385	WORK ORDER NO.

ARMAMENT PACK SEAL TESTS

Requirements for Seal leak tests - Ref. Memo to J. Hodge from J. Housego dated March 7th 1958, para. 2.

1. OBJECT OF TESTS

To check the pneumatic type seals between the armament bay and the armament pack for leakage.

2. EQUIPMENT

2.1 Aircraft 25203 complete with armament pack and missiles (or dummy missiles).

2.2 Air supply and electrical power supply.

2.3 Manometers, flowmeters, thermometers etc. as required.

3. TEST PROCEDURE

3.1 To inflate the pneumatic seals proceed as follows:-

(a) Check the electronics equipment door (just fwd. of the armament bay) to see that it is closed.

(b) Ensure that the armament pack power control switch in the pack service panel is engaged.

NOTE:- The pack service door will have to be closed to perform the tests, and this will automatically engage the power control switch, so for safety, whilst testing with missiles on, the fire control breakers or the umbilical plug should be disconnected. (dummy missiles may be used if desired). Power supplied to the aircraft electrical system should energise the pneumatic valve which directs air into the seals.

R.F.T. PREPARED BY: S.E. WARD	APPROVED BY: Wm C. Broughton	AUTHORIZED BY:
OATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

UNCLASSIFIED

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5050

SHEET NO. 2 OF

DATE: April 18, 1958

AIRCRAFT 25203	ASSIGNMENT NO. X73-385	WORK ORDER NO.

3.2 Maintain pressures of up to ½ psig through out the pack & armament bay via the pack air conditioning ducts, and measure the vol. of air flow required to maintain these pressures.

Leakage rates are to be obtained for pressures starting at 0.1 psig and increasing in increments of 0.1 psi up to 0.5 psig. Pressures are to be measured using water manometers. The air temp. going into the pack and the air temp. in the pack are to be recorded. (The estimated flow of air going into the pack to maintain pressures is approx. 330 lbs/min.)

A close examination of the pneumatic seals is to be made when the pack and the bay are pressurized to 0.5 psig, and a rough check is to be made to determine bad leakage points, if any, by running the hand around the sealing area.

3.3 The above tests are to be done with 4 missiles installed, then repeated without missiles.

4. CONDITIONS

4.1 Tests are to be performed at room temperature.

4.2 A pressure of 18-20 psig is to be maintained in the seals during the tests.

R.F.T. PREPARED BY: S.E. WARD	APPROVED BY: W.C. Etherington	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 8191/22/J
Date April 17, 1958
To S. E. Harper
From T. Roberts
Subject AIRCRAFT 25202 - FIRST FLIGHT R.F.T.

R.F.T. 5049 is attached, covering the first flight of Arrow 1 Aircraft 25202.

T. Roberts

T. Roberts
Technical Flight
Test Co-ordinator

WE*bb

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Messrs J.C. Floyd
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For transmittal to
S/L K. Owen, C.E.P.E.
Detachment

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MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5049

SHEET NO. 1 OF 3

DATE: April 17, 1958

AIRCRAFT 252 02	ASSIGNMENT NO. X73-380	WORK ORDER NO.

FIRST FLIGHT ARROW 1 - AIRCRAFT 25202

1. OBJECT

The object of this flight is to obtain the pilot's preliminary assessment of the handling qualities of the aircraft.

2. EQUIPMENT

2.1 The following damping system signals are to be recorded on an oscillograph during the taxi tests of Section 3.1.

Normal Yaw Axis
2.1.1 Yaw Rate.
2.1.2 Aileron Position.
2.1.3 Lateral Acceleration.
2.1.4 $\int aq$ (product of aileron position and pitch rate)
2.1.5 Servo balance.
2.1.6 Yaw Normal Solenoid.

Emergency Yaw Axis
2.1.7 Yaw Rate
2.1.8 Aileron Position
2.1.9 Lateral Acceleration
2.1.10 Servo Balance.
2.1.11 Yaw Emergency Solenoid.

D.C. Signal
2.1.12 A_y switch.

2.2 No instrumentation will be required for the flight test.
2.3 Two chase aircraft are required: one Sabre 6 and one CF100 Mk. 5.
2.4 Two Vinten F47 Cameras.
2.5 One high speed camera (approx. 1000 frames/sec)
(items 2.4 and 2.5 are to cover taxi runs and take-off and landing).

3. PROCEDURE

3.1 Prior to first flight, taxi runs up to approx. 120 kts, should carried out to check the functioning of the landing parachute, the wheel brake system, and the damping system.

R.F.T. PREPARED BY: Wm C. Ethermyton	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5049

SHEET NO. 2 OF 3

DATE: April 17, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-380	WORK ORDER NO.

3.2 A pre-flight cockpit check should be carried out as given in Appendix 1 of R.F.T. 07-5024.

3.3 A flight is to be made to examine low speed and subsonic handling characteristics.

3.4 Handling is to be carried out at the pilot's discretion within the framework of the flight plan of section 3.5.

3.5 Flight Plan.

3.5.1 Take-off

The take-off should be made without afterburner and without damper.

3.5.2 Climb

With the landing gear extended climb to 5,000 ft. at 200 kts.

3.5.3 First Handling Check

(a) Level off at 5,000 ft. and 200 kts. and assess handling with the landing gear down and dampers off.

(b) With the landing gear down select normal damper GEAR UP and assess handling.

(c) Raise landing gear and assess handling.

(d) Accelerate to 300 kts. and climb to 10,000 ft.

3.5.4 Second Handling Check

(a) Level off at 10,000 ft. and 300 kts. and assess handling.

(b) Switch to emergency mode gear up and assess handling down to 250 kts.

R.F.T. PREPARED BY: W. C. Etherington	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5049

SHEET NO. 3 OF 3

DATE: April 17, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-380	WORK ORDER NO.

(c) At 250 kts. switch to dampers off and assess handling.

(d) Reduce speed to 200 kts. and lower landing gear. Assess handling down to 160 kts. including the effects of speed brakes.

(e) Raise landing gear, select normal damper gear up mode and accelerate to 350 kts.

3.5.5 Second Climb

Climb at 350 kts. to the altitude corresponding to M = 0.90 (approx. 25,000 ft) and continue climbing at M 0.90. Light the afterburners at 30,000 ft. and continue climbing to 40,000 ft.

3.5.6 Third Handling Climb

(a) Level off at 40,000 ft., disengage the damper and assess aircraft handling at M = 0.90.

3.5.7 Descent

Descend at M = 0.90 to approx. 25,000 ft., continuing the descent to circuit height at 350 kts.

3.5.8 Land

R.F.T. PREPARED BY: Wm. C. Etherington	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 7766/16A/J
Date April 1, 1958
To S. E. Harper
From J. D. Hodge
Subject AIR CONDITIONING ENGINEERING TESTS

Herewith R.F.T. No. 5045 "Air Conditioning Engineering Tests" which lists the testing required to establish the operation of the Arrow 1 Air Conditioning System.

J. D. Hodge
Technical Flight
Test Co-ordinator

AA:bb

c.c.
Messrs J. Chamberlin
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5045

SHEET NO. 1 OF

OATE: April 1, 1958

AIRCRAFT 25201 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK OROER NO.

AIR CONDITIONING ENGINEERING TESTS

1. OBJECT

To prove the operation of the Arrow 1 Air Conditioning System.

2. INSTRUMENTATION

All instrumentation as called for in Report No. FAR/C105/1 Section 6 (Issue 8) is required for these tests. For convenience a copy of this section is included with this R.F.T.

3. PROCEDURE

3.1 It is required to have continuous recording of the following quantities at all times throughout flight.

3.1.1 Engine bleed static pressure (port engine)
3.1.2 Engine bleed temperature (port engine)
3.1.3 Turbine inlet total pressure
3.1.4 Turbine inlet temperature
3.1.5 Turbine outlet static pressure
3.1.6 Turbine outlet temperature
3.1.7 Turbine R.P.M.
3.1.8 Cabin inlet temperature
3.1.9 Cabin outlet temperature
3.1.10 Equipment inlet temperature

NOTE:- The measurement of these quantities will establish whether the air conditioning system is working efficiently or not. Should any problems arise it will be necessary to record all data as shown in the instrumentation list.

R.F.T. PREPARED BY: A.Anderson	APPROVED BY: G.Stowe	AUTHORIZED BY: Haworth
OATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION OATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5045

SHEET NO. 2 OF 2

DATE: April 1, 1958

AIRCRAFT 25201 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

3.2 When proper operation of the system has been established recordings of all data are required for three flight cases, to check the theoretical calculations already made. These three cases are as follows:-

3.2.1 Subsonic cruise at 40,000' M = 0.92
3.2.2 Maximum speed at maximum altitude
3.2.3 Cruise at sea level M = 0.4

4. DATA REQUIRED

4.1 Recording of ten items as under Procedure section 3.1.

4.2 Recordings of all instrumentation for Procedure section 3.2.

R.F.T. PREPARED BY: A.R. Anderson	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

March, 1957.

CF-105 - INSTRUMENTATION - ISSUE 8

AIR CONDITIONING SYSTEM

Items underlined are changed from Issue 7, Ref. 4028/02A/J, November 27, 1956.

1. LIST OF INSTRUMENTATION

Number indicates location in system, see sketch.

T - instrument to measure temperature.

P_s - instrument to measure static pressure.

P_t - instrument to measure total head pressure.

ΔP - $P_t - P_s$.

Location See Sketch	Instruments Required		Description
1	T	P_s	As close to Port engine bleed as possible.
2		P_s	Downstream from the reducing valve on Port engine line at such a distance that the valve does not affect the measurement.
3	T	P_s ΔP	Mass flow for fuel pressurization system.
4	T	P_t	Turbine inlet conditions.
5	T	P_s (rake)	Turbine outlet conditions. The temperature probe should be located downstream from the turbine outlet at the junction point.
6	T	RPM	Fore and aft bearing temperatures and shaft R.P.M.
7A	T		Cabin inlet (at temperature sensor).
7B	T	P_s ΔP	Mass flow from cabin. Measure temperature at sensor and pressure downstream from this.
8	T	P_s	Cabin conditions. Temperature to be measured at six points.
9	T	P_s or P_t (rake)	As close as possible to fan inlet. (Static or total may be measured)
10	T	P_s or P_t (rake)	As close as possible to fan outlet. (Static or total may be measured)
11	T		Ram air exit.
12	T		In equipment duct.

(Continued.....

2. SUMMARY

2.1 Temperature

Instrument	Range (°F)	Accuracy (F°)	Accuracy (% of Range)	Recording Frequency
T1	+100 +1000	±10	1%	1/sec
T3	-20 +400	±5	1%	5/min
T4	-20 +250	±5	2%	5/min
T5	-30 +100	±4	2%	5/min
T6	0 +500	(to be built into turbine unit)		2/min
T7A&B	-20 +130	±5	3%	5/min
T8 (6 off)	0 +200	±2	1%	
T9	0 +500	±10	2%	5/min
T10	0 +600	±10	2%	5/min
T11	0 +500	±10	2%	5/min
T12	0 +140	±5	3%	5/min

2.2 Static Pressure

Instrument	Range (psia)	Accuracy (psi)	Accuracy (% of Range)	Recording Frequency
P_s1	0-360	±10	2%	1/sec
P_s2	0-100	±1	1%	1/sec
P_s3	0-100	±1	1%	5/min
P_s5 (rake)	0-20	±0.2	1%	5/min
P_s7	0-20	±0.2	1%	5/min
P_s8	0-20	±0.1	0.5%	1/sec
P_s9 (rake)	0-20	±0.2	1%	5/min *
P_s10(rake)	0-20	±0.2	1%	5/min *

* Note: Either static or total may be measured.

(Continued.....

2.3 Total Head Pressure

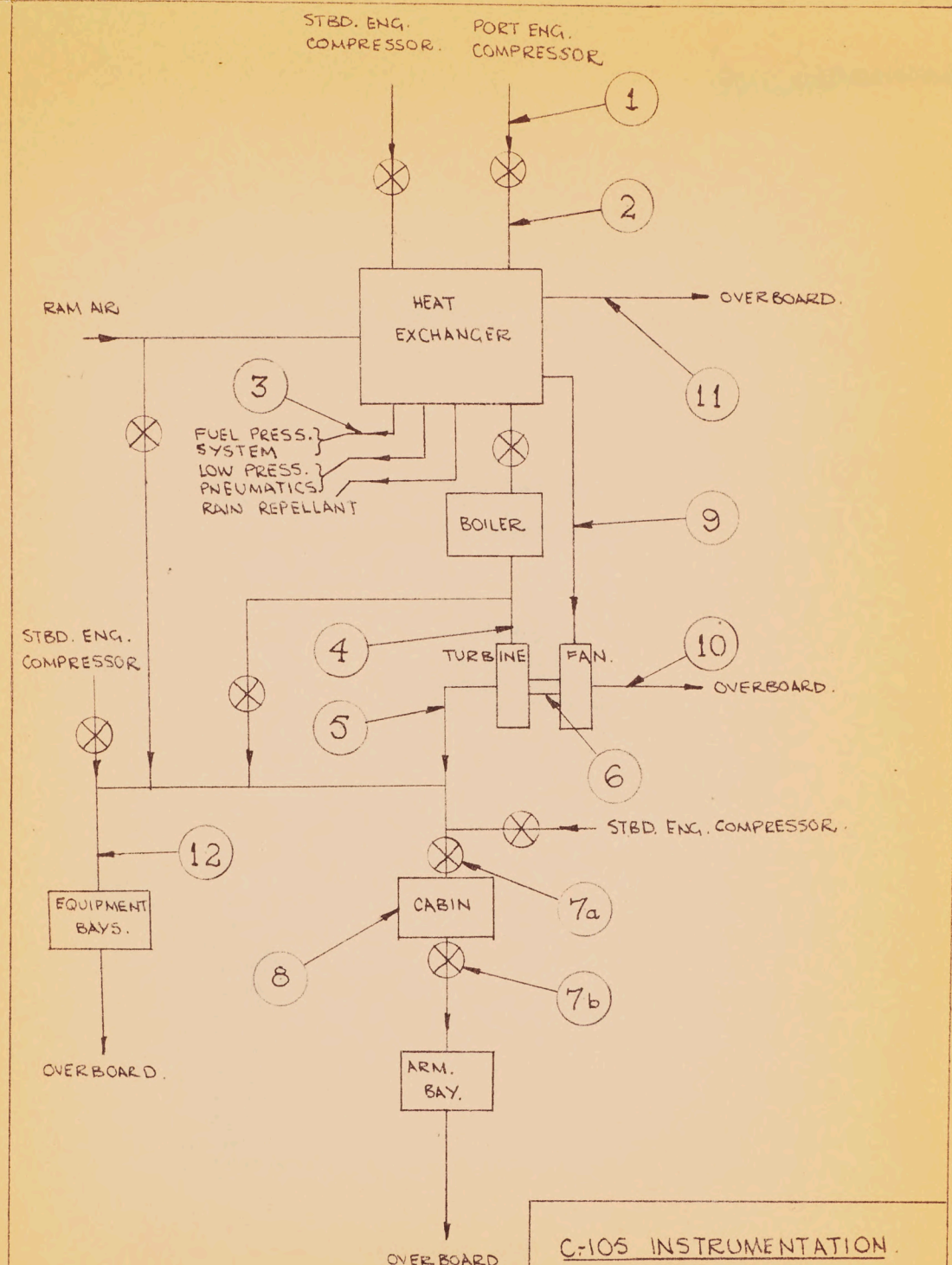
Instrument	Range	Accuracy (psi)	Accuracy (% of Range)	Recording Frequency
$\Delta P3$	0-5 psi	± 0.25	5%	5/min
$P_t 4$	0-100 psia	± 1	1%	5/min
$\Delta P7$	0-1 psi	± 0.05	5%	5/min
$P_t 9$ rake	0-30 psia	± 0.3	1%	5/min *
$P_t 10$ rake	0-30 psia	± 0.3	1%	5/min *

* See note Page 23.

2.4 Miscellaneous

In addition, it is required to measure turbine R.P.M., see location 6 in sketch. As in the case of bearing temperature, transducers will be built into the unit by AIResearch.

The sampling rate required for turbine R.P.M. is 5/sec.



C-105 INSTRUMENTATION.
AIR-CONDITIONING SYSTEM
ISSUE 8.

MAR. '57 J.D.H.

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 7748/03A/J
Date April 1, 1958
To S. E. Harper
From J. D. Hodge
Subject ANTENNA EVALUATION TESTS - ARROW 1

(1) Herewith R.F.T. No. 5044, which supercedes and cancels R.F.T. No. 5003 "Antenna Evaluation Program CF105".

AA*bb

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5044

SHEET NO. 1 OF

DATE: April 1, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-386	WORK ORDER NO.

ANTENNA EVALUATION TESTS - ARROW 1

1. OBJECT

To establish verification of model antenna range patterns for a single plane.

2. EQUIPMENT

2.1 A ground station should be set up as detailed in Section 3 "Ground Station Equipment" of Report No. 71/Systems 13/3.

2.2 The Arrow 1 should be equipped for UHF transmission, with the AN/ARC-34 or equivalent, and for L-Band transmission, with the AN/APX-6. Details of the operation and modification of this equipment or given in sections 4.1, 4.2 and 4.3 of Report No. 71/Systems 13/3.

2.3 Also required for calibration purposes is a C100 aircraft with the same equipment installed as the Arrow 1.

2.4 Throughout the tests the dummy Irdome will be fitted to the Arrow 1.

3. PROCEDURE

The complete evaluation procedure for flight tests is given in section 5 of Report No 71/Systems 13/3. The C100 aircraft is to be used for calibration purposes in order to cut the required flight time of the Arrow 1 to a minimum.

Three UHF frequencies and two L-band frequencies will be tested and each pattern will be tested at least once and checked on a different day in order to establish repeatability. In order to consider the repeatability successfully established an accuracy of ± 1 db must be achieved.

R.F.T. PREPARED BY: H.J. Anderson	APPROVED BY: W.I. Taylor.	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5044

SHEET NO. 2 OF

DATE: April 1, 1958

AIRCRAFT 25202	ASSIGNMENT NO. X73-386	WORK ORDER NO.

The Irdome will be fitted in these tests, and dependent on the results of this assessment, the Irdome or the fin antenna may need to be relocated. The proposal as laid out in Report No. 71/Systems 13/3 requires that for each antenna coverage for only a single plane to measured by flight test, the entire antenna pattern then being determined by model range techniques.

4. DATA

Report should include complete details of tests carried out and results obtained.

R.F.T. PREPARED BY: A T Anderson	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

F/L Hanke

For review + comments

Return please to S/L Armstrong

BAP

~~CLASSIFIED~~

S/L Patterson - Please study the attached RFT for implications re: instrumentation and forward to F/L Hart for his review and comments.

Chas Armstrong S/L
AT-1
14 April

(2) AT-1

No major implications, other than using telemetry as the prime data acquisition agency. This appears to be an interim measure

G. N. Patterson S/L
AT 2 15 Apr.

(3) AT-1

No comment now. Regret I have not been able to keep sufficiently abreast of this programme to be of much help on detail at this time.

D Hart F/L
ID-1
23 Apr 58.
53127

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 7591/02B/J
Date March 26, 1958
To S. E. Harper
From J. D. Hodge
SUBJECT ARROW 1 ELECTRICAL SYSTEM FLIGHT TESTS

R.F.T. 5041, is attached, covering flight tests to be carried out during the Phase 1 engineering test program of aircraft 25201, 25202 and/or 25203. These tests require that dummy loads be provided to simulate the 8.3 KVA de-icing system load. The initial tests will be carried out with the instrumentation pack power supplied from the shedding bus, as it is at present on aircraft 25201. For later flights, it will be necessary to rearrange the power supply system so that the instrumentation can be supplied from the essential bus.

'Item 15, D.C. Voltage of trans, rect. unit' may be deleted from the Electrics instrumentation as only one TRU voltage measurement is required. This change will be included in the next issue of Report FAR/C105/1.

WE*bb

J. D. Hodge
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Test Co-ordinator

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J. Chamberlin RCAF for transmittal
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5041

SHEET NO. 1 OF 3

DATE: March 26, 1958

AIRCRAFT 25201 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

ARROW 1 ELECTRICAL POWER SYSTEM FLIGHT TESTS

1. INTRODUCTION

It is necessary that the electrical A.C. and D.C. power generating systems installed in the Arrow 1 A/C be proven capable of handling all electrical load conditions which are likely to be connected through appropriate switch gear, relays, control equipment, lighting, radio etc. to the main and auxiliary busses which receive power from two 30 KVA A.C. generators for A.C. requirements and two parallelled transformer rectifier units for D.C. requirements.

2. OBJECT

2.1 To check that the combined operation of the A.C. generators, transformer rectifier units and constant speed drives is adequate for the electrical loads supplied on the Arrow 1 A/C.

2.2 To check that the cooling air flow through the A.C. generator is adequate for all conditions of electrical loading and that the maximum operating temperature of the A.C. generator rear bearing is within safe operating limits.

2.3 To check temperatures in different zones where electrical equipment is mounted to ensure operating ambients are satisfactory.

3. FLIGHT CONDITIONS

Instrumentation measurements are to be taken during the following conditions:-

(a) Taxi
(b) Take off & Climb.
(c) Minimum speed at S.L.
(d) Intermediate speeds at S.L.
(e) Max. speed at S.L.
(f) Typical speeds at each 10,000 ft. of altitude
(g) Max. speed at max. altitude
(h) Landing

R.F.T. PREPARED BY: W.C. Etherington	APPROVED BY: S.A. Brown	AUTHORIZED BY: J.C. Floyd
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5041

SHEET NO. 2 OF 3

DATE: March 26, 1958

AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.
25201 25202 25203	X73-384	

4. EQUIPMENT & INSTRUMENTATION

Instrumentation for the electrical system measurements is to be installed in the A/C in accordance with Report FAR/C105/1, Instrumentation A/C 1, 2 & 3.

1. Temp of aft bearing - port alternator.
2. Voltage A Ø port alternator.
3. Voltage B Ø port alternator.
4. Voltage C Ø port alternator.
5. Voltage A Ø stbd alternator.
6. Voltage B Ø stbd alternator.
7. Voltage C Ø stbd alternator.
8. Current A Ø port alternator.
9. Current B Ø port alternator.
10. Current C Ø port alternator.
11. Current A Ø stbd alternator.
12. Current B Ø stbd alternator.
13. Current C Ø stbd alternator.
14. D.C. voltage of trans rect unit
15. Frequency (A phase on the essential bus)
16. D.C. current of trans rect unit port.
17. D.C. current of trans rect unit stbd.
18. Exhaust temp of T.R.U.S. (one unit only.)
19. Temp of N.W. well, above circuit breaker
20. Temp of N.W. well, above master warning box
21. Temp of electrical bay.
22. Temp of main wheel well (one side only) above brakes.

During initial instrumentation flights the power supply for the instrumentation pack is to remain as it is at present, i.e. - Telemetry on the essential bus with the remainder supplied from the shedding bus.

R.F.T. PREPARED BY:	APPROVED BY	AUTHORIZED BY:
Wm C. Etherington	L.A. Brown	
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5041

SHEET NO. 3 OF 3

DATE: March 26, 1958

AIRCRAFT 25201 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

This means that only Telemetry will be retained in the event of an A.C. generator failure or an engine flame out.

For later flights relays should be installed to cut out R.H. intake de-icing supply allowing all instrumentation to be supplied from the essential bus so that generator shut-off and transfer can be accomplished while instrumentation monitors these features.

The relays mentioned above are to be controlled by a switch in the C/P to allow pick up of de-icing power with drop out of instrumentation for the start, taxi and land configuration during icing conditions. For the later flights, loads should be added to one generator (R.H.) to simulate icing conditions. A 3 Ø load of 3.4 KVA (balanced unity P.F.) is to be continuous during icing simulation with a 3 Ø load of 4.9 KVA (balanced, unity P.F.) to be cycled 4 secs on and $\frac{1}{2}$ sec off during icing simulation. This test is to be conducted during the cruise case only.

5. PROCEDURE

On initial flights (with instrumentation power pick off as is) records are to be taken during condition quoted in para. 3 with no manual load switching. Some flights should be conducted during icing conditions if possible. On later flights (with instrumentation power pick off as per para. 4) records are to be taken during conditions quoted in para. 3 with generator switching to cause transfer and simulated icing load switch. Switching to be conducted during the cruise condition only.

6. DATA REQUIRED

6.1 A.C. phase to neutral voltages.
6.2 A.C. line currents
6.3 Frequency (one phase essential bus)
6.4 D.C. voltage
6.5 D.C. currents
6.6 Generator rear bearing temperature
6.7 Compartment temperatures.

Accumulated data to be presented in table and, where possible graphical form.

R.F.T. PREPARED BY: Wm C. Ethrington	APPROVED BY: J.H. Brown	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref: 8568/02B/J
Date: April 29, 1958
To: S. E. Harper
From: T. Roberts
Subject: ARROW 1 ELECTRICAL SYSTEM FLIGHT TESTS

Herewith R.F.T. 5041, Add. 1, which supersedes and cancels R.F.T. 5041. This Addendum covers flight tests to be carried out during the Phase 1 engineering test program of aircraft 25201, 25202 and/or 25203. The initial tests will be carried out with the instrumentation pack power supplied from the shedding bus, as it is at present on aircraft 25201. For later flights, it will be necessary to rearrange the power supply system so that the instrumentation can be supplied from the essential bus.

T. Roberts
Technical Flight
Test Co-ordinator

AA*bb

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W/C G. Waterman
W/C G. Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen C.E.P.E. Detachment.

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5041 Add. 1

SHEET NO. 1 OF

DATE: April 29, 1958

AIRCRAFT 25201 2 5202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

ARROW 1 ELECTRICAL POWER SYSTEM FLIGHT TESTS

1. OBJECT

1.1 To check that the cooling air flow through the A.C. generator is adequate for all conditions of electrical loading and that the maximum operating temperature of the A.C. generator rear bearing is within safe operating limits.

1.2 To check temperatures in different zones where electrical equipment is mounted to ensure operating ambients are satisfactory.

2. FLIGHT CONDITIONS

Instrumentation measurements are to be taken during the following conditions:-

(a) Taxi
(b) Take off & Climb.
(c) Minimum speed at S.L.
(d) Intermediate speeds at S.L.
(e) Max. speed at S.L.
(f) Typical speeds at each 10,000 ft. of altitude.
(g) Max. speed at max. altitude.
(h) Landing.

3. EQUIPMENT & INSTRUMENTATION

1. Temp of aft bearing - port alternator.
2. Frequency (A phase on the essential bus).
3. Exhaust temp of T.R.U.S. (one unit only.)
4. Temp of N.W. well, above circuit breaker.
5. Temp of N.W. well, above master warning box.
6. Temp of electrical bay.
7. Temp of main wheel well (one side only) above brakes.

R.F.T. PREPARED BY:	APPROVED BY: Ld Brown	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5041 Add. 1

SHEET NO. 2 OF

DATE: April 29, 1958

AIRCRAFT 25201 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

During initial instrumentation flights the power supply for the instrumentation pack is to remain as it is at present, i.e. - Telemetry on the essential bus with the remainder supplied from the shedding bus.

This means that only Telemetry will be retained in the event of an A.C. generator failure or an engime flame out.

For later flights all instrumentation is to be supplied from the essential bus so that generator shut-off and transfer can be accomplished without loss of instrumentation.

4. PROCEDURE

On initial flights (with instrumentation power pick off as is) records are to be taken during conditions quoted in para. 2. On later flights (with instrumentation power pick off as per para. 3) records are to be taken during conditions quoted in para. 2 with generator switching to cause transfer. Switching to be conducted during the cruise condition only.

5. DATA REQUIRED

5.1 Frequency (one phase essential bus)
5.2 Generator rear bearing temperature.
5.3 Compartment temperatures.

Accumulated data to be presented in graphical form vs time.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 7956/05/J
Date April 9, 1958
To S. E. Harper
From T. Roberts
Subject ARROW 1 - FUEL SYSTEM TESTS

Herewith Addendum 1 to R.F.T. No. 5040, Fuel System Engineering Tests which deletes section 3.7 from R.F.T. 5040.

T. Roberts

AA*bb

T. Roberts
Technical Flight
Test Co-ordinator

c.c.
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W/C G. Waterman
W/C G. Waterman (2) AVRO T.S.D.
RCAF for transmittal to S/L K. Owen, C.E.P.E. Detachment.

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Project Approval

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5040 Add.o1

SHEET NO. 1 OF 1

DATE: April 9, 1958

AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.
25201 25202 and/or 25203	X73-384	

Please revise R.F.T. 5040 as follows:-

3.7 Delete this section completely as it has been decided that the Arrow 1 will not undergo inverted flight, Fuel System testing.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

W/C G. Waterman
S/L Armstrong

UNCLASSIFIED

I. Perhaps S/L Armstrong should read this + comment. On quick glance it appears O.K.
K.D.J.O.

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref: 8566/09/J
Date: April 29, 1958
To: S. E. Harper
From: T. Roberts
Subject: Landing Gear, Speed Brake and Hydraulics System Tests

Herewith R.F.T. 5039, which specifies the flight testing required on the landing gear, speed brakes, utility and flying control hydraulics.

T. Roberts

AA*bb

T. Roberts
Technical Flight
Test Co-ordinator

c.c.
Messrs J. Chamberlin
F. Brame
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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5039

SHEET NO. 1 OF 5

DATE: April 29, 1958

AIRCRAFT 25201 25202 and/or 20203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

LANDING GEAR, SPEED BRAKE, AND HYDRAULIC SYSTEM TESTS

1. OBJECT

To obtain a qualitative assessment of landing gear and speed brake operation and to record hydraulic system pressures and temperatures on the Arrow 1 aircraft.

2. INSTRUMENTATION

2.1 Flying Control Hydraulics

(a) Pressure out of filter box (A & B systems)
(b) Pressure just upstream of heat exchanger (B system)
(c) No. 1 Heat exchanger inlet and outlet temperatures (B systems)
(d) No. 2 Heat exchanger outlet temperature (B system)
(e) Port engine pump inlet temperature (B system)
(f) Accumulator piston position.
(g) Compensator piston position.

2.2 Engines

H.P. rotor R.P.M. (both engines)

2.3 Utility Hydraulics

(a) Pressure regulator 'system' port pressure
(b) Pressure regulator 'return' port pressure.
(c) Pump inlet pressure.
(d) Pump inlet temperature.
(e) Brake cylinder 'return' temperature.
(f) Brake pad temperatures

2.4 Landing Gear

(a) Extension and retraction times
(b) For and aft. leg acceleration (left and right U/C).

R.F.T. PREPARED BY: A.J. Anderson	APPROVED BY: D. Rayton (?) / M.C. Etherington	AUTHORIZED BY: [signature]
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

UNCLASSIFIED

R.F.T. NO. 5039

SHEET NO. 2 OF 5

DATE: April 29, 1958

AIRCRAFT 25201 and/or 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

Note:- For Range of values and accuracy see FAR/C105/1, Issue 7, Sections 2, 3, 5, and 9 and IDI 6884/02A/J.

3. PROCEDURE

3.1 Landing Gear

3.1.1 Operate recorder(s) during extension and retraction of landing gear at 250 knots.

3.1.2 Operate recorder(s) during normal take off (while the aircraft is accelerating from unstick speed to 250 knots I.A.S.)

3.1.3 Obtain continuous trace recordings of the following items. Under Instrumentation - items 2.2 and 2.3 (a), (b), (c), and (d).

3.1.4 The Pilots' Comments on landing gear operation should also be reported.

3.2 Speed Brakes

3.2.1 Operate recorder(s) during the extension, and retraction of the speed brakes under three conditions. These conditions are 200, 300 and 400 knots E.A.S. at any altitude.

3.2.2 Obtain continuous traces of system pressures and temperatures, and engine H.P. rotor R.P.M.

3.2.3 The pilots comments on speed brake operation should also be reported.

3.2.4 With speed brakes selected down increase A/C speed until the speed brakes blow back. Record pressure regulator "system" port pressure and report pilots comments on this condition.

R.F.T. PREPARED BY: A. Anderson	APPROVED BY: W. C. Ethrington	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

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MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

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R.F.T. NO. 5039

SHEET NO. 3 OF 5

DATE: April 29, 1958

AIRCRAFT 25201 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

3.3 Utility Hydraulic System Temperature Measurements.

3.3.1 Obtain continuous trace recordings of brake fluid port temperatures and brake pad temperatures, throughout twelve landings, and for 10 minutes after the aircraft parks. The landing conditions and pilots comments should also be reported.

3.3.2 Continuous trace recordings of pump inlet temperature are required under the conditions below. It is also required that the results be presented in the form of graphs vs time from engine start to shut down. The quantities shown on these graphs should be, pump inlet temperature, outside air temperature, altitude, EAS and engine HP compressor R.P.M.

The flight conditions required are:-

3.3.2.1 First engineering flight.

Stabilized Cases

3.3.2.2 (a) Straight and level flight at M = .92, 40,000' alt, cruise r.p.m. A/B off.
(b) Straight and level flight at M = .92, 30,000' alt, cruise r.p.m. A/B off.

3.3.2.3 Straight and level flight at M = 0.4, 5,000' alt. cruise r.p.m.

3.3.2.4 (a) Straight and level flight at M = 1.5, 40,000' cruise power.
(b) Straight and level flight at M = 1.5, 50,000', cruise power.

3.3.2.5 Straight and level flight at M = 1.09, 5,000' (or max. power).

3.3.2.6 (a) Straight and level flight M = 2.0 (or max) 30,000'.
(b) Straight and level flight M = 2.0 (or max) 40,000'.

R.F.T. PREPARED BY:	APPROVED BY: Wm C. Sherington	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

SECRET
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R.F.T. NO. 5039

SHEET NO. 4 OF 5

DATE: April 29, 1958

AIRCRAFT 25201 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

(c) Straight and level flight M = 2.0 (or max) 60,000'.

Transient Cases

3.3.2.7 Deceleration at 40,000' (const) from M = 2.0 (or max) to M = .92 cruise.

3.3.2.8 Descent from Max. alt. to sea level M = .92

(a) Normal Descent.
(b) Low rate of descent (as used to extend range).

3.3.2.9 Dive from 60,000' to 30,000'.

3.3.2.10 Decelerate at 5,000 ft. from max speed to minimum by reducing power on both engines to idle until more power is required to maintain safe flying speed.

NOTE:- These flight conditions are the same as those requested in R.F.T. 5031 "Engine Installation Temperatures". Section 4.

3.4 Flying Control Hydraulics

3.4.1 Pressures Continuous trace recordings are required of pressures out of filter A and B systems and the pressure on the return line B system (as per IDM 6884/02A/J) for the first engineering flight and subsequent flights that cover other parts of the flight envelope and specific manoeuvre cases.

3.4.2 Temperatures The following temperatures should be obtained on continuous trace recordings, for the same flight conditions as specified in section 3.3.2., above.

3.4.2.1 No. 1 Heat exchanger inlet temp. (B system).

3.4.2.2 No. 1 Heat exchanger outlet temp. (B system).

R.F.T. PREPARED BY:	APPROVED BY: Wm E. Cetherington	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

~~SECRET~~ UNCLASSIFIED

R.F.T. NO. 5039

SHEET NO. 5 OF 5

DATE: April 29, 1958

AIRCRAFT 25201 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

3.4.2.3 No. 2 Heat exchanger outlet temp (B system).

3.4.2.4 Pump inlet temperatures.

3.4.3 Miscellaneous

3.4.3.1 Accumulator piston position should be recorded on continuous trace for 1st engineering flight plus subsequent flights covering specific manoeuvres.

3.4.3.2 Compensator piston position, should be recorded on a continuous trace, for the flight conditions as specified in 3.4.2.

3.5 Landing Gear Accelerations

Continuous trace recordings of landing gear accelerations are required during the take-off, landing and taxi of the first 12 flights.

R.F.T. PREPARED BY:	APPROVED BY: Wm C Etherington	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 7397/04/J
Date March 19, 1958
To S. E. Harper
From J. D. Hodge
Subject ENGINE HANDLING AND INSTALLATION TESTS

Herewith R.F.T. No. 5037, Engine Handling and Installation tests which details the testing and instrumentation required to assess the handling characteristics and check the installation of the J75 engines in the Arrow 1, aircraft 25201, 25202 and/or 25203.

Item 3.7. Engine igniter plug temperature is an addition to the instrumentation list FAR/C105/1 and will be incorporated in the next issue of this list.

J. D. Hodge
Technical Flight
Test Co-ordinator

AA*bb

Project Approval

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Detachment.

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5037

SHEET NO. 1 OF

DATE: March 19, 1958

AIRCRAFT 25201 25202 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

ENGINE HANDLING AND INSTALLATION TESTS

1. OBJECT

To assess the engine handling characteristics of the J75-P3 and J75-P5 engines and to establish that their installation is successful.

2. EQUIPMENT REQUIRED

Arrow Mk. 1. Aircraft 25201, 25202 and/or 25203.

3. INSTRUMENTATION REQUIRED

3.1 Port engine L.P. compressor R.P.M.

3.2 Stbd engine L.P. compressor R.P.M.

3.3 Port engine H.P. compressor R.P.M.

3.4 Stbd engine H.P. compressor R.P.M.

3.5 Turbine discharge temp (T_{T7}) Port.

3.6 Turbine discharge temp (T_{T7}) Stbd.

3.7 Engine igniter plug temperature at harness elbow. Port.

3.8 Static pressure, zone 2 top rear compressor.

3.9 Static pressure, zone 2 bottom mid-section of tailpipe.

3.10 Differential in ejector shroud, rel. to ambient between stn's 820 and 825 at bottom of shroud.

3.11 Port engine intake total head pressure (P_{t_2}).

3.12 Stbd engine intake total head pressure (P_{t_2}).

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5037

SHEET NO. 2 OF

DATE: March 19, 1958

AIRCRAFT 25201 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

3.13 Turbine discharge pressure(P_{t_7}) Port.

3.14 Turbine discharge pressure(P_{t_7}) Stbd.

3.15 Temp. at inboard shroud (on outer surface of engine E) Stn. 836.

4. PROCEDURE

4.1 It is required to establish for the Arrow 1 aircraft series, a relight flight envelope commencing at 10,000 ft. altitude and subsequently in increments of 5,000 ft up to 35,000 ft. The possibility of relighting above the latter altitude is to be investigated at the Test Pilot's discretion, relative to increment levels. This test should be carried out using Pratt and Whitney curve No. 17921 dated the 17th November 1955.

4.2 Tests are to be carried out at fixed throttle settings from sea level to maximum altitude to establish the possible existance of Jet Pipe temperature and R.P.M. creep.

4.3 To establish single engine windmilling rotor speeds (N_2) at varying altitudes and aircraft forward speeds. This test should be carried out in conjunction with Engine Relight Tests (Item 4.1).

4.4 To establish engine igniter plug temperatures at the harness elbow location, on the port engine and elbow connection only. This should be recorded over the full range of flight speeds at 30,000 ft.

4.5 The afterburner light up characteristics are to be established at altitudes between 30,000 ft. and maximum.

4.6 To establish engine acceleration and deceleration times from "Idle" (N_2) R.P.M. to maximum and vice versa, at altitudes between 10,000 ft. and 50,000 ft.

4.7 To investigate the Pitch and Yaw effect upon engine stability at varying altitudes at the Pilot's discretion, and within the current limited flight envelope.

R.F.T. PREPARED BY: A.F. Anderson	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5037

SHEET NO. 3 OF

DATE: March 21, 1958

AIRCRAFT and/or	ASSIGNMENT NO.	WORK ORDER NO.
25201 25202 25203	X73-384	

4.8 To investigate the engine stability during descent with both throttles at idle under the following conditions;-

a) 40,000 ft. to 18,000 ft.
b) 30,000 ft. to 18,000 ft.

4.9 The following recordings should be measured in the flight regions specified, or as close to these as possible within the scope of the flight program.

	ITEM	ALTITUDE	M	R.P.M.	ATMOS.
4.9.1	Port engine intake static pressure (P_{S_2})	S.L.	Static	Full	cold
4.9.2	Stbd engine intake static pressure (P_{S_2})	S.L.	Static	Full	Cold
4.9.3	Static pressure, Zone 2 Top of rear compressor	30,000 ft	2.0	Full, A/B on	Std.
4.9.4	Static pressure, Zone 2 Bottom mid-section of tailpipe	30,000 ft	2.0	Full, A/B on	Std.
4.9.5	Differential in ejector shroud relative to ambient	S.L.	1.09	Full, A/B off	Std.
	between Stn. 820 and 825 at botton of shroud.	S.L.	Static	Full, A/B on	Std.
4.9.6	Port engine intake total head pressure (P_{t_2})	S.L.	Static	Full, A/B on/off	Std.
	Subsonic accel.		0.2 to .92	Full R.P.M.	A/B on, off
	Subsonic climb		.92	Full R.P.M.	A/B on, off
	Subsonic cruise	40,000 ft.	.92	Req'd R.P.M.	A/B off

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5037

SHEET NO. 3 OF

DATE: March 21, 1958

AIRCRAFT 25201 and/or 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

Supersonic cruise 50,000 ft.	1.5	Full R.P.M. Partial A/B
Supersonic speeds 50,000 ft.	1.0 to 2.0	Full R.P.M. Full A/B

4.9.7	Stbd engine intake total head pressure (P_{t_2})	as in 4.9.4
4.9.8	Turbine discharge pressure (P_{t_7}) Port	as in 4.9.4
4.9.9	Turbine discharge pressure (P_{t_7}) Stbd.	as in 4.9.4
4.9.10	Turbine discharge temp. (T_{t_7}) Port	as in 4.9.4
4.9.11	Turbine discharge temp. (T_{t_7}) Stbd.	as in 4.9.4
4.9.12	Temp at Inboard shroud (on outer surface of engine) Stn. 836	as in 4.9.4
4.9.13	L.P. and H.P. compressor R.P.M.'s Port and Stbd.	as in 4.9.4

5. DATA REQUIRED

5.1 Pilots comments on all flights concerning these tests.

5.2 All appropriate recordings from the instrumentation listed within this R.F.T. (section 3).

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

S/L Armstrong
No comment at this time. K.D

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref: 9615/09/J
Date: May 27, 1958
To: S. E. Harper
From: T. Roberts
Subject: ARROW 1 - WHEEL BRAKE TESTS (R.F.T. 5035) AIRCRAFT 25201

Please delete the following items in R.F.T. 5035.

1. Delete item "3.6.1. Touchdown point." There is no test which requires recordings of a landing, only of taxi runs.

2. Delete "icy etc", from the note immediately following item 4.4. There will be no attempt to carry out tests on icy runways.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

Project Approval

*b

c.c.
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FORM 1749 A

S/L Armstrong
No Comment. K.O

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref: 9671/01/J
Date: May 28, 1958
To: S. E. Harper
From: T. Roberts
Subject: R.F.T. 5034, Add. 1, ARROW 1 - STRUCTURAL INTEGRITY TESTS

(1)

It is suggested that the determination of the parachute deployment load be carried out during the landing tests being made on aircraft 25202 as per R.F.T. No. 5054.

A recording of parachute load (see paragraph 3.1 of R.F.T. 5034) will be required, together with the following:-

(i) Aircraft speed.
(ii) Aircraft weight.
(iii) Ambient pressure.
(iv) Ambient temperature.
(v) Wind velocity.

Normal aircraft landing weights may be employed, but more information would be obtained if both a high and a low speed landing were made.

It is required to relate deployment load and aircraft speed. Since these parameters will be determined by different means (oscillograph and photograph respectively) it is important that it be possible to correlate them closely.

(2)

T. Roberts
Technical Design Coordinator
FLIGHT TEST

Project Approval

*b

c.c.
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FORM 1749 A

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 7900/04/J
Date April 8, 1958
To S. E. Harper
From J. D. Hodge
Subject Engine Installation Temperature Flight Tests

R.F.T. No. 5031, Addendum 1 covering changes in the instrumentation requirements for flight tests to measure the structural and system temperatures relating to the engine installation in Arrow 1 aicraft 25201, 25202, and 25203, is attached.

WE*bb

J. D. Hodge
Technical Flight
Test Co-ordinator

c.c.
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MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5031 Add. 1

SHEET NO. 1 OF 1

DATE:

AIRCRAFT 25201 25202 and/or 25203	ASSIGNMENT NO. X73-384	WORK ORDER NO.

ENGINE INSTALLATION TEMPERATURES

The following changes should be made in the instrumentation requirements of R.F.T. 5031:

1. Section 2, Item 2 and 3 should be deleted.

2. Section 3, add items 23, 24, 58 and 58a.

R.F.T. PREPARED BY: W. C. Etherington	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

S/L Armstrong
DNO command
RAFA

AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref: 1042/04/J
Date: June 9, 1958
To: S. E. Harper
From: T. Roberts
Subject: ENGINE INSTALLATION TEMPERATURE FLIGHT TESTS

Herewith Addendum No. 2 to R.F.T. No. 5031, which changes and clarifies the manner in which the data is to be presented to Technical Design.

T. Roberts
Technical Design Coordinator
FLIGHT TEST

DHM:b

c.c.
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FORM 1749 A

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5031 Add. 2

SHEET NO. 1 OF 1

DATE: June 9, 1958

AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.
25201 25202 25203		

ENGINE INSTALLATION TEMPERATURE FLIGHT TESTS

Section 5. DATA does not read correctly in the original R.F.T., and should be as follows:-

5.1 Scaled continuous trace recordings of all parameters for the duration of the flight.

5.2 Tabulated readings may be requested after studying the time histories of 5.1. The following will be specified at each request.

(a) The parameters to be digitized.

(b) The time period over which they are to be digitized.

(c) The frequency at which the samples are to be taken.

It is understood that the tabulated data is expressed as a percentage of full scale only. Full scale values are to be provided, and scaling will be performed manually by Technical Design.

5.3 Pilot's comments

R.F.T. PREPARED BY: D.H.Martin	APPROVED BY: E.R.Durst	AUTHORIZED BY: J.C.Mitchell
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref No: 7283/16A/J
Date: April 9, 1958
To: S. E. Harper
From: T. Roberts
Subject: AIR CONDITIONING ENGINEERING TESTS - ARROW 1 AIRCRAFT 25205

Herewith R.F.T. No. 5030, 'Air Conditioning Engineering Tests', which specifies the Pre-Flight and Flight Testing required on Arrow 1 - Aircraft 25205.

T. Roberts
Technical Flight
Test Co-ordinator

AA*bb

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MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5030

SHEET NO. 1 OF

DATE: April 9, 1958

AIRCRAFT 25205	ASSIGNMENT NO. X73-384	WORK ORDER NO.

AIR CONDITIONING ENGINEERING TESTS

1. OBJECT

To prove the operation of the Air Conditioning System, with Auxiliary system as installed in aircraft 25204 and 25205.

2. INSTRUMENTATION

All instrumentation as called for in section 6 of FAR/C105/2 Issue 2, is required for these tests. For convenience a copy of this list is attached to this R.F.T.

3. PROCEDURE

3.1 The Air Conditioning Pre-Flight tests on this aircraft should be completed as in R.T. No. 08-778, Addendum 1. This test comprises of a Flow Distribution check and a check during the engine run.

3.2 It is required to have continuous recording of the following quantities at all times throughout one or two flights. The measurement of these quantities will establish whether the air conditioning system is working efficiently or not. Should any problems arise it will be necessary to record all data as shown in the instrumentation list. (FAR/C105/2, Issue 2).

3.2.1. Engine bleed static pressure (port engine)

3.2.2. Engine bleed temperature (port engine)

3.2.3. Turbine inlet total pressure.

3.2.4. Turbine inlet temperature.

3.2.5. Turbine outlet static pressure.

3.2.6. Turbine outlet temperature.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5030

SHEET NO. 2 OF

DATE: April 9, 1958

AIRCRAFT 25205	ASSIGNMENT NO. X73-384	WORK ORDER NO.

3.2.7. Turbine R.P.M.

3.2.8. Cabin Inlet Temperature.

3.2.9. Cabin outlet temperature.

3.2.10. Equipment inlet temperature.

3.3 When it has been established that the system is functioning correctly recordings of all data are required for three flight cases. The Flow Distribution measurements are of particular importance, as with the auxiliary system in operation they are necessary to check the theoretical calculations already made. The three flight cases are as follows:-

3.3.1. Subsonic cruise at 40,000 ft. M = 0.92.

3.3.2. Maximum speed at maximum altitude.

3.3.3. Cruise at sea level M = 0.4.

4. DATA REQUIRED

4.1 Record 10 items as under Procedure section 3.1.

4.2 Record from all instrumentation for Procedure section 3.2.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY: for F.P. MITCHELL
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

SECTION 6 AIR CONDITIONING SYSTEM

Owing to the decision to install auxiliary air conditioning equipment there is a requirement for more instrumentation than initially anticipated.

The following measurements will be necessary in each compartment which is serviced (including the cabin).

MEASUREMENT	RANGE	ACCURACY	ACCURACY % OF FULL RANGE	SAMPLING FREQUENCY
Inlet Temperature	-20°F to +130°F	± 5°F	± 3%	5/min.
Inlet Pressure	0 to 20 psia	± 0.2 psi	± 1%	5/min.
Mass Flow (ΔP)	0 to 1 psi	± 0.05 psi	± 5%	5/min.
Outlet Temperature	0°F to 200°F	± 5°F	± 3%	5/min.

In addition, the following measurements are required:-

Engine Bleed Temperature		As in FAR/C105/1 Part 6, Issue 8.
Engine Bleed Pressure		
Main Refrigerator Turbine	Inlet Temperature	
	Inlet Pressure	
	Outlet Temperature	
	Outlet Pressure	
	R.P.M.	

Auxiliary System Supply	Mass Flow	20 - 50 lb./min.
	Temperature	0 - 500°F
	Pressure	0 - 100 psia
Auxiliary System Outlet	Temperature	0 - 200°F
	Pressure	0 - 120 psia

AVRO AIRCRAFT

INTER DEPARTMENTAL MEMORNADUM

DATE: February 27th, 1958
REF: 6779/01/J
TO: MR. S.E. HARPER
FROM: Mr. J.D. Hodge
SUBJECT: ARROW 1 FIRST FLIGHT RFT

Herewith RFT 07-5024 with attachments covering first flight ARROW 1 Aircraft 25201.

J.D. Hodge
Technical Flight Test Coordinator

JDH:df

cc Messrs:
J.C. Floyd
J.A. Chamberlin
R.N. Lindley
F.H. Brame
C.S. Marshall
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J. Gale
Central Files - 1

FORM 1749 A

AVRO AIRCRAFT LIMITED
MALTON, ONTARIO.
REQUISITION FOR FLIGHT TEST

R.F.T. No. 07-5024
Sheet No. 1 of 3
Date. February 27th, 1958

AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.
25201	X73-362	

INITIAL FLIGHTS

ARROW 1

DATA:

1. OBJECT

The object of these flights is to obtain the pilots preliminary assessment of the handling qualities of the aircraft prior to engineering flights.

2. EQUIPMENT

2.1 Instrumentation as defined in memo 3749/22/J (Attached)

2.2 Two chase aircraft are required. One Sabre 6 and one CF100 Mk. 5

2.3 Two Vinten F47 Cameras.

2.4 1 High speed camera (approx. 1000 frames/sec)

(Item 2.3 and 2.4 to cover take-off and landing)

3. PROCEDURE

3.1 Procedure is given for first flight only. Amendments will be added to this R.F.T. to cover subsequents flights as required.

3.2 A pre-flight cockpit check is given in Appendix 1.

3.3 A flight is to be made at moderate altitude to examine low speed and subsonic handling characteristics.

3.4 Handling is to be carried out at the pilots discretion within the framework of the following flight plan.

R.F.T. Prepared By:	Approved By:	Authorized By:
Date for Completion	Priority	Estimated Completion Date:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO.

REQUISITION FOR FLIGHT TEST

R.F.T. No. 07-5024

Sheet No. 2 of 3

Date. February 27th, 1958

AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.
25201	X73-362	

3.5 Flight Plan

3.5.1 Take-off

The take-off should be made without afterburner and in the normal damper (yaw only) mode with gear down selector switch on.

3.5.2 Climb

With the landing gear extended climb to 5000 ft. at 200 kts.

3.5.3 Accelerate and Climb

At 5000 ft. level off at 200 kts. Raise landing gear and switch to normal damper, gear up mode. Accelerate to 350 kts. Climb to 12,000 ft. at 350 kts. At this altitude and speed carry out mild maneouvres and assess aircraft and engine handling.

3.5.4 Climb

Climb to 20,000 ft. at 350 kts, with normal damper gear up mode. At 20,000 ft. and 350 kts, switch the emergency mode, gear up, for sufficient time to insure that this mode is operative. It is not required to assess maneouvring and handling in this mode.

Switch to normal damper, gear up mode.

3.5.5 Low Speed Handling

Reduce speed to 200 kts, and lower landing gear. Select Normal Damper, gear down mode. Carry out mild maneouvres and assess handling between 160 kts and 200 kts.

3.5.6 Descend

Descend at 200 kts, to sea level in normal damper, gear down mode.

R.F.T. Prepared By:	Approved By:	Authorized By:
Date for Completion	Priority	Estimated Completion Date:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO.

REQUISITION FOR FLIGHT TEST

R.F.T. No. 07-5024

Sheet No. 3 of 3

Date. February 27th, 1958

AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.
25201	X73-362	

Land.

3.6 Fuel Used and Time

3.6.1 Appendix 2 shows an estimate of the fuel used and time taken for the above procedure.

3.7 Recommended Take-off and Landing Procedure

Attached Appendix 3 give recommended take-off and landing procedures.

4. CONDITIONS

4.1 The configuration and flight limitations are given in the Design Certificate for aircraft 25201.

5. DATA

5.1 Reference memo 3749/22/J

5.2 Camera Records

5.3 Plots comments

R.F.T. Prepared By: Approved By: Authorized By:

Date for Completion Priority Estimated Completion Date:

AVRO AIRCRAFT

PILOTS CHECK LIST

RFT 07-5024
APPENDIX 1

After Entering the Cockpit

Manual harness release inforward position.

All switches off except ALT., L-P., Damper

Air Brakes position

Ground supply A.C.

UHF Mode 1

RMI, Standby compass

Oxygen - normal, emergency

Starting

Start R H engines Check Hydraulic Systems Flying Controls and Utility

Start Port engine

Check crossfeed, L.R.

Engage normal damping

Check emergency damping

Return to normal

Check all dampers out (Stick switch)

Engage normal again and select U/C down Mode

Check warning lights ON

Check emergency and all controls movement

Check all dampers out

Engage normal again and "gear down"

Check all controls full movement

Check trimming range of all controls

Set all controls neutral

Check oxygen contents again

Check air conditioning setting - Normal - Cockpit press

Check emergency fuel system (at idle, lights on) bring back

Before take-off

Trimmers neutral

Damper on, Damper normal U/C down mode

Speed brakes closed

Check canopy locked

Harness

Pitot heat, switch on.

Before landing

Speed brakes open

U/C down

Harness

RPM 75-80

Approach 180

Touchdown 160

End of Flight

Switch off pitot heater

Stop RH engines check flying controls and utility hydraulics

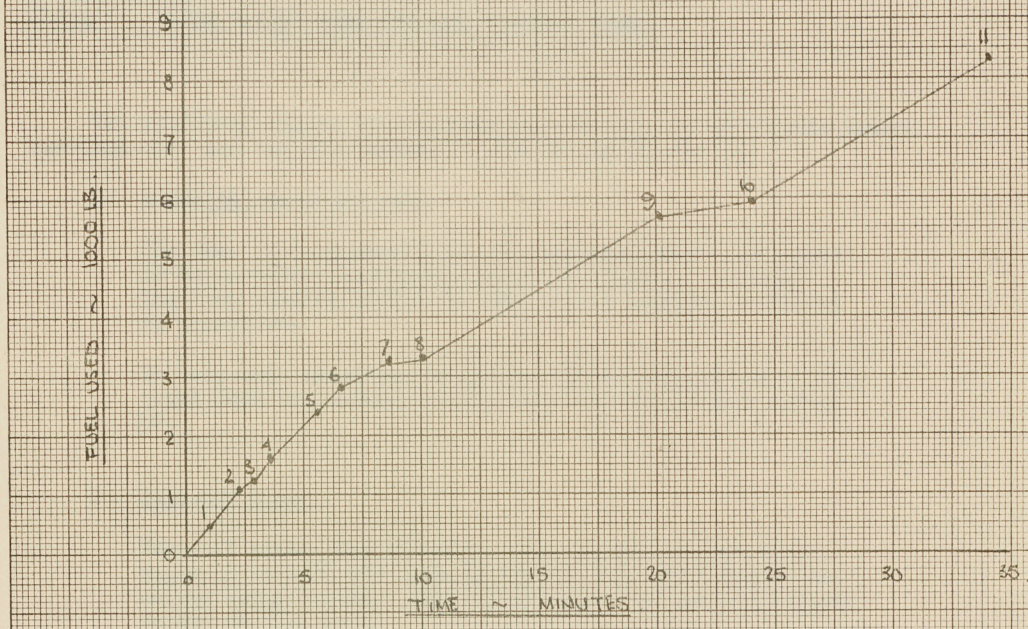
ARROW 1

R.F.T. 5024

AIRCRAFT 25201

APPENDIX 2.

FIRST FLIGHT — FUEL vs TIME



NO.	TIME	CUM TIME	FUEL	CUM. FUEL	ACTION
1	1·0	1·0	500	500	ACCEL TO 250 KTS
2	1·4	2·4	600	1100	CLIMB TO 5000'
3	·5	2·9	150	1250	ACCEL. TO 350 KTS
4	·7	3·6	350	1600	CLIMB TO 12000'
5	2·0	5·6	840	2440	MANOEUVRE
6	1·0	6·6	400	2840	CLIMB TO 20,000'
7	2·0	8·6	450	3250	MANOEUVRE
8	1·5	10·1	50	3300	DECEL. TO 200 KTS
9	10·0	20·1	2400	5700	MANOEUVRE
10	4·0	24·1	250	5950	DESCEND TO S.L.
11	10·0	34·1	2400	8350	LOITER & LAND

Avro Aircraft Limited

INTER-DEPARTMENTAL MEMORANDUM

Date 24th, January 1958 Reference No: 5805/09/J
To Mr. F. Brame
From S. Kwiatkowski
Subject ARROW 1 - FIRST FLIGHT TAKE-OFF AND LANDING SPEEDS

The following values are recommended for c.g. at .30 $\bar{c}$ with under-carriage down and weights between 49,000 lb and 60,000 lb.

1. Speed to raise the nose

The nose raising should not be initiated until the speed 10 knots below recommended take-off speed is reached. The nose raising should be done with a maximum of 10° of up elevators.

To keep nose wheel on the ground before take-off and after touch down the amount of down elevator should not exceed 5°.

2. Take-Off Speed

Take-off speed with military power should be 150 knots. Angle of attack will then be between 10° and 12° for the weight range quoted. With afterburner lit take-off speed should be 145 knots.

The angle of attack will then be the same as for military power.

3. Approach Speed

Approach speed should be 180 knots ± 10 knots Angle of Attack range 8° - 11 1/2°.

4. Touch Down Speeds

The recommended touch down speed is 160 knots for all weights. The maximum permissible tolerance on touch down speed is ± 20 knots.

5. Tail Clearance at Touch Down

Arrow 1 in one "g" landing has a tail clearance angle of 16.5°, with fully compressed undercarriage and 2" tire deflection this clearance angle is 15.5°.

For recommended touch down speeds the following clearances for one "g" landings will exist:

Speed	Angular 49000 lb.	Clearance 60000 lb.
140	3 1/4°	3/4 °
160	5°	4°
180	7 3/4°	6 1/4°

With fully compressed undercarriage these clearances will reduce by 1°. A one degree corresponds to approx. 5" clearance at the tail.

Above estimates include ground effects with no power.

6. Incidence Limitation

The limitation of true incidence is 15° for all flight conditions. The indicated angle of attack is affected by bending of the fwd fuselage. Therefore the indicated incidence limitations is 15° less 1/2° for each incremental "g".

Information contained in this note was derived from Report P/Control/86 a copy of which can be obtained from the writer.

SK/g

S. Kwiatkowski
Chief of Stability and Control

cc Messrs J. A. Chamberlin
J. Lucas
C. Lindow
D. Rogers
D. Scard
J. Zurakowski
J. Hodge
W. Potocki

INTER-DEPARTMENTAL MEMORANDUM

Ref 3749/22/J
Date November 7, 1957
To See Circulation
From J. D. Hodge - Technical Flight Test Co-ordinator
D. R. Woolley - Flight Test Engineering Supervisor
Subject DATA EDITING AND MONITORING PROCEDURE FOR FIRST FLIGHT

The Flight Test Dept. have arranged to record all the required flight data, and the Technical Dept. have considered how to process what data they receive. There is a region in between, however, where the jobs of both departments merge (namely the editing stage) and no definite procedure has yet been suggested.

It is considered that some clarification is needed on this subject so that everyone concerned will be aware of what is expected when flight testing starts. The whole point of editing is to save time, and every effort should be made to ensure full use of it.

A more complete study of the editing problem will be made in the near future, but for the time being we will restrict ourselves to that of the first flight, which is in so many ways different from any other flight. This case has been considered in some detail for the purposes of general familiarization.

J. D. Hodge
Technical Flight
Test Co-ordinator

D. R. Woolley
Flight Test
Engineering Supervisor

DHM/bb

c.c.
Messrs J. A. Chamberlin
F. H. Brame
S. E. Harper
D. N. Scard (7)
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S. Kwiatkowski
C. Marshall
H. Malinowski
A. Thomann
A. Cornish
D. Royston
G. Shaw
J. McKillop

INTRODUCTION

The only mandatory requirement for data from the first flight ie the limited amount obtained via telemetry. The Flight Test Dept. are not required to be ready to supply additional information on the airborne Data Tapes, and we will assume that this will not be available. This report will be only concerned with the intelligent viewing of data in real time (i.e. at the same time as it is actually occuring)

The two primary purposes of telemetry are:

(i) Safety monitoring.

(ii) Initial editing.

From the point of view of the first flight the emphasis is on the former, and to a large extent the parameters requested for telemetry were chosen with this in mind.

Telemetered information is transmitted by one of the following two methods:

(i) FM/FM giving a parameter in a continuous form.

(ii) PWM/FM giving a parameter commutated at 20/eec.

VISUAL PRESENTATION

In addition to being recorded on magnetic tape, the telemetered parameters are made visible in one of two forms.

(i) On Sanborn Recordere as continuous traces.

(ii) On the multi-channel monitoring 'scope ae a vertical bar preeentation.

The former gives a permanent record, while the latter doee not. If it ie decided that a permanent continuous trace record of any item on the 'ecope is required for further study, the magnetic tape may be played back after the flight to obtain eame.

The types of output will be considered in turn.

(i) Sanborn Recordere. Three recorders will be used, each with 8 channele. Two of these will be used for the 14 Stability and Control parameters (6 FM and 8 PWM), and the Bypaes Gille open and ehut indication (one or two channele, as required). Naturally eny PWM channel which ie played back on a Sanborn will appear ae smoothed 20/eec eteps.

The third Sanborn will be used as follows:

1 - 5 Vibration pick up accelerometers (FM)
6 - 7 Fuel contante in port and etbd. collector tanks (PWM)
8 Air conditioning turbine RPM (PWM)

(ii) Multi-channel 'scope. The scope can accommodate up to 40 parametere. For the first flight we will only be using 9 of them.

1 - 5 Engine inetallation etructural temperatures.
6 Engine oil temperature.
7 Fuel temperature.
8 Flying control hydraulics temperature.
9 Utility hydraulics tempsrature.

It can bs seen that in thie particular case all are temperature readings. It ie proposed to introduce a yellow and red line eyetem to facilitate the monitoring of temperature. A yellow and a red mark will be made on the ecreen over each temperature column in the 'scope, corresponding to specific temperatures. Yellow and red line temperatures will always have the same meaning, as defined below. Values have been assigned to theee in each case for the first flight, and are listed on eheet 4.

(i) Yellow. A figure at which the monitoring engineer should start to take close notice, although going above this value is not in itself a dangeroue condition. The range time (which will be on display throughout the teet) should be noted each time thie line is crossed (whether increasing or decreaeing).

(ii) Red. A value above thie line cannot be tolerated and eteps must be taksn to avoid going above it, and in the event of exceeding it, to return below it in all haete.

(iii) Further Reduction. 23 of the telemetered parameters will thus bs presented as analog tracee by means of the Sanborn Recorders and the 9 viewed via the 'scope can, if neceesary, be presented ae continuoue traces after the flight. This is all that will be required in most cases. In addition portione of tha work may be digitized and tabulated vsreus time, if deeired. It is believed that there will not be an I.B.M 704 program completed in time for the firet flight, so that it will not be possible to perform any computations. This will mainly be of concern to the Stability and Control group. No serious consequencss are forseen however eince:

(a) Other than the fact that the aircraft will be in the air, there will not be any actual Stability and Control tests carried out on this flight.

(b) The time gap between firet and second flight will be euch that manual computation will be possible .

PERSONAL REQUIREMENT

(1) Sanborn Recordere. Two engineere from the Technical Dept. and one from Flight Teet will be required for the two Stability Sanbone. For the third Sanborn, one engineer from the Technical Dept. and one from Flight Test for the Structural Integrity accelerometere, and one from Flight Teet for the Fuel Syetem and Air Conditioning tracee. Thie givee a total of six men on three Sanborne (it ehould be noted that it is coneidered desirable to limit numbere to a maximum of two men per Sanborn).

(2) Multi-Channel 'scope. One engineer from the Flight Test Dept. will be sufficient to monitor the 'ecope and to act ae neceseary ehould any exceseive temperature be approached.

ACTION

(1) Sanborn Recordere. The three engineere required for the two Stability Sanborns ehould be nominated so that they may discuse the job in hand amonst themselves. They may wieh to epecify the placing of parametere on the two Sanborne. The engineer ehoeen from Flight Teet to monitor the Fuel System and Air Conditioning tracee of the third Sanborn ehould make himself familiar, by discueeion in the Technical Dept. with the probleme likely to be encountered and the remediee.

(2) Multi-Channel 'ecope. The coloured line system described above is not ae cut-and-dried as it may appear. It is essential that the engineer who monitors this should contact all thoee concerned in the Technical Dept. so that he may determine such thinge as:

(a) The order of temperature expected.
(b) A normal rate of change of temperature.
(c) The necessary action to reduce an excessive temperature.
(d) Whether yellow line times are indeed required.
(e) What will decide whether a continuous trace record ie required.

SYSTEM	PARAMETER	YELLOW TEMP (°F)	RED TEMP (°F)
Engine Installation	Centre rear mount. Stn. 711.	225	265
	Top of shroud inner flange Stn. 803.	225	265
	Top flange of I-beam on C.L. Through heat exchangers. Stn. 592	225	265
	Top flange of former directly below firewall Stn. 663	225	265
	Lower longeron engine bay. Stn. 591.	225	265
	Oil temperature at starboard engine inlet.	210	250
	Fuel temperature at inlet to starboard engine burner.	200	225
Flying Control Hydraulics	Port engine pump inlet temperature.	200	225
Utility Hydraulics	Pump inlet temperature.	200	225

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 7949/22/J
Date April 8, 1958
To S. E. Harper
From T. Roberts
Subject ARROW 1 - FIRST FLIGHT R.F.T.

Herewith Addendum 5, of R.F.T. 07-5024, giving the flight plan and fuel used for the fourth flight of the initial series of flights.

T. Roberts
Technical Flight
Test Co-ordinator

TR*bb

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W/C G. Waterman
W/C G. Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen C.E.P.E. Detachment.

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5024 Add 5

SHEET NO. 1 OF 2

DATE: April 8, 1958

AIRCRAFT 25201	ASSIGNMENT NO.	WORK ORDER NO.

This addendum covers the flight plan and fuel used for the fourth flight of the initial series of flights, and supersedes Addendum 4.

1. INSTRUMENTATION

1.1 Telemetry

Telemetry requirements are identical to those for flight Number 2.

1.2 Oscillograph

It is requested that roll rate signal be added to the oscillograph channels, either as an extra measurement or in place of emergency aileron angle signal, if possible.

1.3 Tape Recorder

A tape recorder is required to enable recordings to be made in the event of radio transmission failure.

2. FLIGHT PLAN

2.1 Take-off

Prior to take-off inform 'Frank' of RPM, J.P.T. and pressure ratio at military throttle setting.

Take-off without afterburner. Normal damper, gear down mode may be engaged at the pilots discretion.

Raise landing gear, select normal damper gear up mode and accelerate to 350 kts. EAS.

2.2 Climb

Climb to 350 kts. EAS to 10,000 ft. level out and accelerate at 10,000 ft. to 450 kts. EAS.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5024

SHEET NO. 2 OF 3

DATE: April 8, 1958

AIRCRAFT 25201	ASSIGNMENT NO.	WORK ORDER NO.

2.2 Climb Cont'd

Climb at 450 kts. EAS to the altitude corresponding to M = 0.9, (approximately 15,000 ft), and continue climbing at M = 0.9. Light the afterburners individually at 10,000 ft. and continue climbing to 45,000 ft. Report to 'Frank' RPM, J.P.T. and pressure ratio every 5,000 ft. during climb.

2.3 Test Period

Level off at 45,000 ft, disengage the damper and assess engine handling - throttling one engine back to idling and dive brake operation.

Accelerate to M = 1.1 and repeat as for M = .9.

Engage normal damper gear up mode, and accelerate to M = 1.3 in increments of 0.05M carrying out aileron taps at M = 1.15, 1.20, 1.25 and 1.30 in conjunction with ground operations controller. Repeating engine handling and dive brake operation at M = 1.20 and 1.30.

Continue to accelerate to M = 1.4, if necessary the aircraft may be dived to 35,000 ft. without exceeding EAS limitation.

2.4 Descent

Reduce speed to M = 0.90 and descend to approximately 25,000 ft, continuing to descend to circuit height at 350 kts. EAS.

Approach and land.

3. FUEL USED AND TIME

3.1 Attached appendix 2f shows an estimate of fuel used and time for the above flight plan.

3.2 During taxi the aircraft is estimated to use 1400 lb/hour/engine.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5024 Add. 4

SHEET NO. 3 OF 3

DATE: April 8, 1958

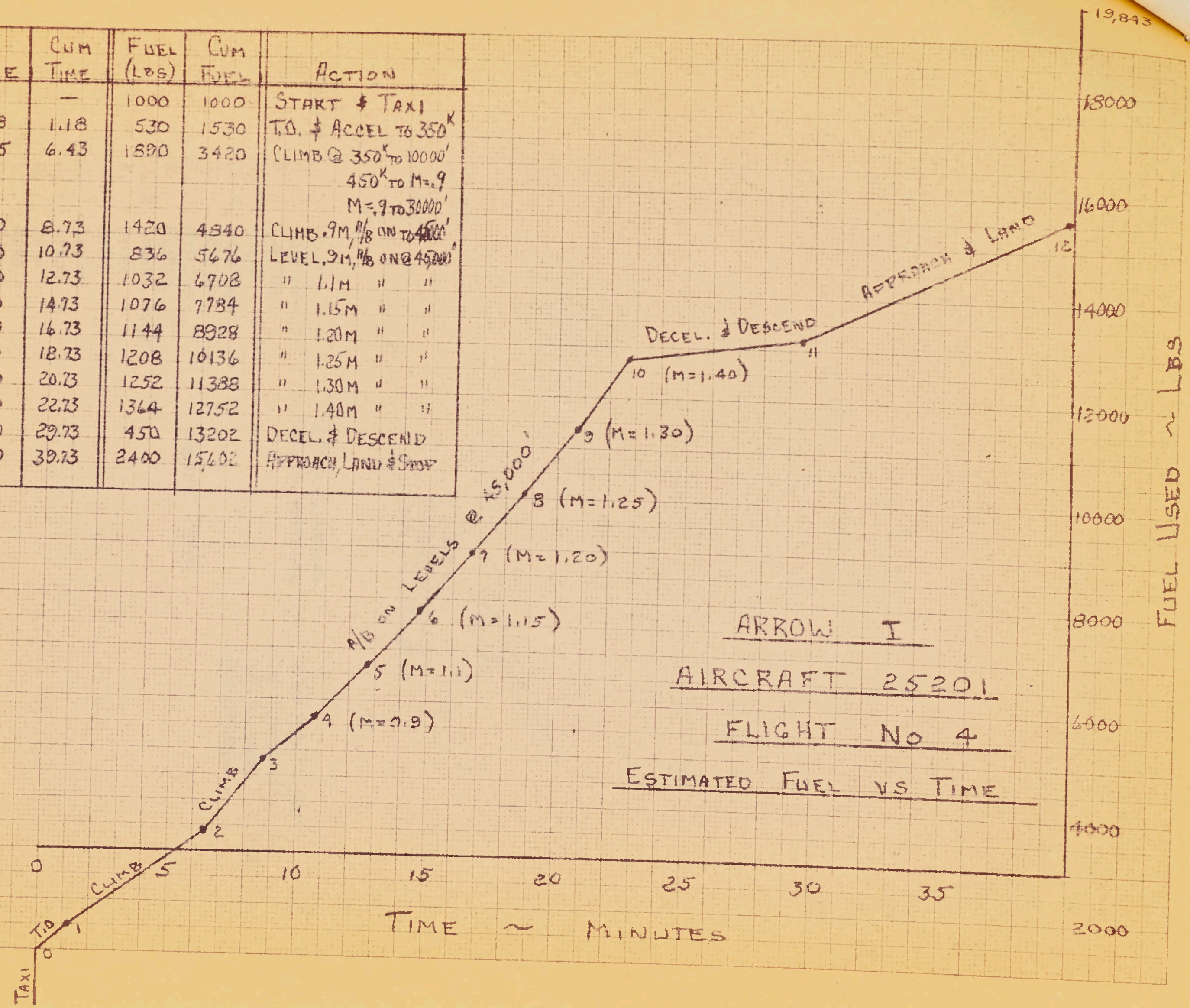
AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.

3. FUEL USED AND TIME

3.3 2500 lb. of fuel shall remain unuseable in addition to any fuel used to ballast the aircraft.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

No	Time	Cum Time	Fuel (Lbs)	Cum Fuel	Action
0	—	—	1000	1000	Start & Taxi
1	1.18	1.18	530	1530	T.O. & Accel to 350K
2	5.25	6.43	1890	3420	Climb @ 350K to 10000' 450K to M=.9 M=.9 to 30000'
3	2.30	8.73	1420	4840	Climb .9M, A/B on to 45000'
4	2.00	10.73	836	5676	Level .9M, A/B on @ 45000'
5	2.00	12.73	1032	6708	" 1.1M " "
6	2.00	14.73	1076	7784	" 1.15M " "
7	2.00	16.73	1144	8928	" 1.20M " "
8	2.00	18.73	1208	10136	" 1.25M " "
9	2.00	20.73	1252	11388	" 1.30M " "
10	2.00	22.73	1364	12752	" 1.40M " "
11	7.00	29.73	450	13202	Decel. & Descend
12	10.00	39.73	2400	15602	Approach, Land & Stop



Arrow I

Aircraft 25201

Flight No 4

Estimated Fuel vs Time

AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 8123/01/J
Date April 15, 1958
To S. E. Harper
From T. Roberts
Subject ARROW 1 - FIRST FLIGHT R.F.T.

Herewith Addendum 6, of R.F.T. 07-5024, giving the flight plan and fuel used for the 4th flight of the initial series of flights.

T. Roberts
Technical Flight
Test Co-ordinator

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W/C G. Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen C.E.P.E. Detachment.

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5024 Add. 6

SHEET NO. 1 OF

DATE: April 14, 1958

AIRCRAFT 25201	ASSIGNMENT NO.	WORK ORDER NO.

This addendum covers the flight plan and fuel used for the fourth flight of the initial series of flights, and supersedes Addendum 5.

1. INSTRUMENTATION

1.1 Telemetry

Telemetry requirements as for flight number 2 plus AVC output in telemetry trailer receiver, (GRR-7), to be monitored by recording D.C. output, identify trace with comments on signal intelligibility.

1.2 Oscillograph

Requirements as for flight number 2 plus the following:-

Aircraft static pressure.
Differential pressure.
R/H engine flow control unit power lever position.
Yaw emergency solenoid signal.
Yaw normal solenoid signal.
Roll rate normal axis.

1.3 Data Tape

Data tape should be installed to record the following:-

Pilot's voice.
L/H engine fuel flow.
R/H engine fuel flow.

1.4 Temp Sensitive Paint Bars

Temp sensitive paint bars are required on all six hydraulic pump discharge lines and on the three pump suction manifold lines to indicate temp in excess of 240°F and 310°F.

R.F.T. PREPARED BY:	APPRDVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIDRITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5024 Add. 6

SHEET NO. 2 OF

DATE: April 14, 1958

AIRCRAFT 25201	ASSIGNMENT NO.	WORK ORDER NO.

2. FLIGHT PLAN

2.1 Take-Off

Prior to take-off inform 'Frank' of RPM, JPT and pressure ratio at military throttle setting. Take-off without afterburner and without damper. Raise landing gear and accelerate to 250 kts. EAS.

2.2 Climb

Climb at 250 kts. EAS. to 10,000 ft. then level out.

2.3 Handling

2.3.1 Engage normal damper gear up mode and assess A/C handling at 250 kts. EAS. Repeat with emergency damper gear up mode, and check damping in pitch with controls free.

2.3.2 Repeat 2.3.1 at 300 kts. EAS.

2.3.3 Engage normal damper gear up mode and accelerate to 350 kts. check A/C handling, and check damping in pitch with controls free.

2.3.4 Repeat 2.3.3. at 400 kts. EAS, and pull $2\frac{1}{2}$g at 400 kts. EAS, and check effect asymmetric power

2.3.5 Accelerate to 450 kts. EAS, damper off, engage normal damper gear up mode and repeat 2.3.4.

2.4 Climb

Climb at 400 kts. EAS. to the altitude corresponding to M = 0.9, (approximately 20,000 ft.), and continue climbing at M = 0.9 to 30,000 ft. During climb inform 'Frank' every 5,000 ft. (or as frequent as is practical) of RPM, JPT, and pressure ratio. Light A/B's individually at 30,000 and continue climb at M = 0.9 to 40,000 ft.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5024 Add. 6

SHEET NO. 3 OF 3

DATE: April 14, 1958

AIRCRAFT 25201	ASSIGNMENT NO.	WORK OROER NO.

2.5 Test Period

2.5.1 Level off at 40,000 ft., disengage the damper and assess effect of asymmetric power and check dive brake operation at M = 0.9. Repeat with normal damper gear up mode.

2.5.2 Accelerate to M = 1.1 normal damper gear up mode and carry out aileron taps, then repeat as for 2.5.1.

2.5.3 Disengage damper and accelerate to M = 1.15 and repeat as for 2.5.2.

2.5.4 Proceed to higher speeds in increments of 0.05 MN in conjunction with ground operations controller, repeating procedure as for 2.5.3.

Ground operations controller should advise "201" when test should be discontinued in as far as fuel remaining is concerned.

If pilot gets garbled transmission at or above 30,000 ft. pilot should depress his tone control button to C.W. position, also interphone should be turned to "hot mic" to check whether his sidetone is garbled.

2.6 Descent

Reduce speed to M = 0.9 and descend to approx. 25,000 ft., continuing to descend to circuit height at 350 kts. EAS.

Approach and Land.

3. FUEL USED AND TIME

3.1 Attached curve shows an estimate of fuel used and time for the above flight plan.

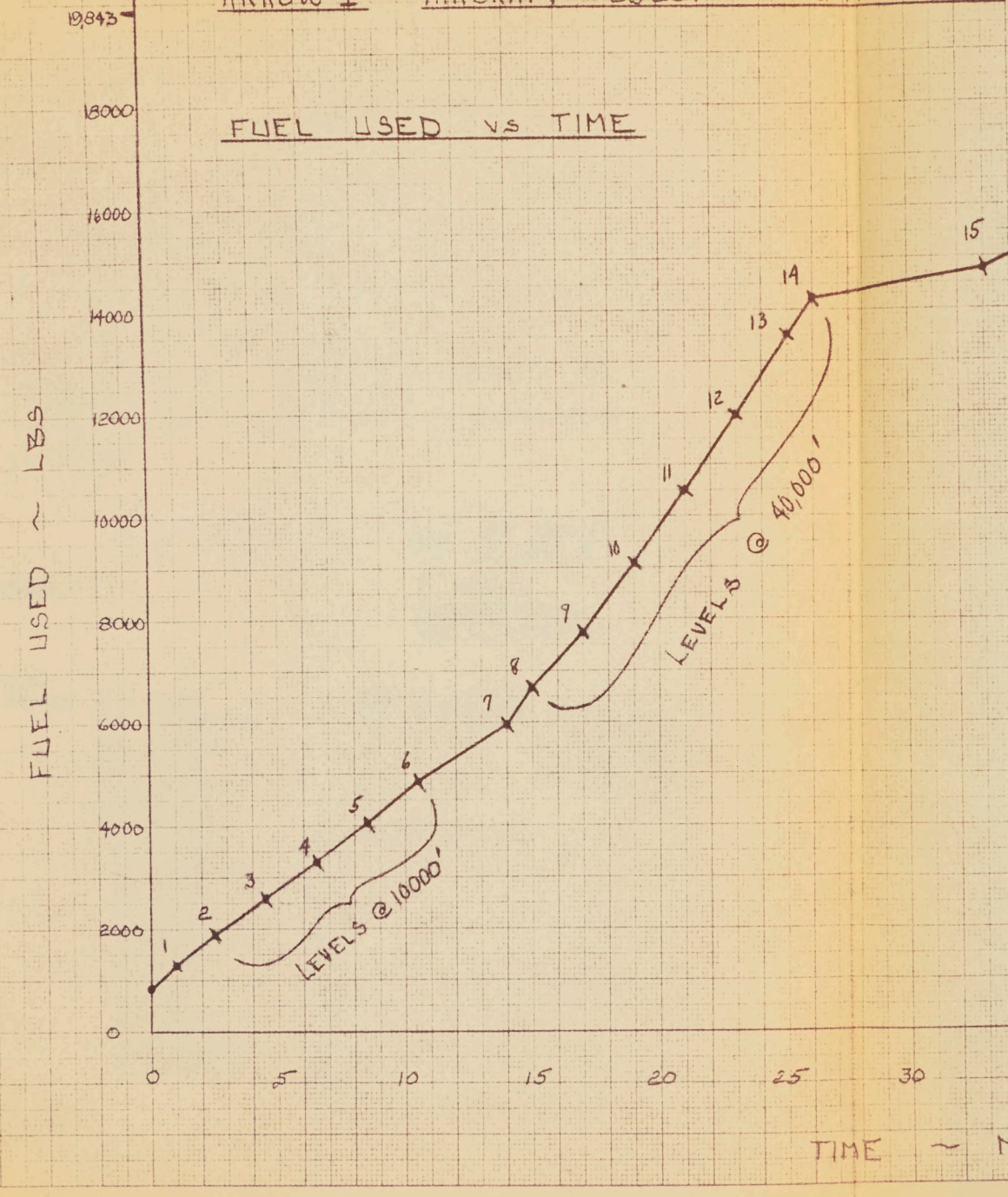
3.2 During taxi the aircraft is estimated to use 1400 lb/hr/engine.

3.3 2500 lb. of fuel shall remain unuseable in addition to any fuel used to ballast the aircraft.

R.F.T. PREPAREO BY:	APPROVEO BY:	AUTHORIZEO BY:
OATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

ARROW I AIRCRAFT 25201 FLIGHT No. 4

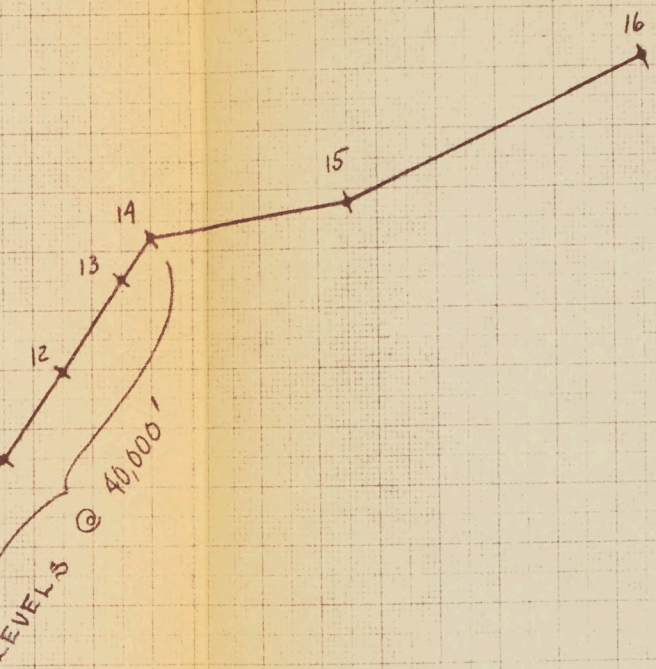
FUEL USED vs TIME



SHEET NO. _____ REPORT NO. _____

DATE APRIL 15, 1958 PREP. BY R.W.

01 FLIGHT NO. 4



No	TIME	CUM TIME	LBS FUEL	CUM FUEL	ACTION
0	—	—	843	843	ENG. START & TAXI
1	1.00	1.00	450	1293	T.O. & ACCEL TO 250K E.A.S.
2	1.50	2.50	600	1893	CLIMB TO 10000' @ 250K E.A.S.
3	2.00	4.50	690	2583	ACCEL. & LEVEL @ 300K E.A.S.
4	2.00	6.50	725	3308	" " " 350 "
5	2.00	8.50	760	4068	" " " 400 "
6	2.00	10.50	800	4868	" " " 450 "
7	3.50	14.00	1100	5968	CLIMB TO 20000 @ 400K E.A.S. & TO 30,000' @ M=0.9, A/B OFF
8	1.00	15.00	680	6648	CLIMB TO 40,000' M=0.9, A/B ON
9	2.00	17.00	1100	7748	LEVEL @ 40,000', M=0.90, A/B ON
10	2.00	19.00	1340	9088	" " M=1.10 "
11	2.00	21.00	1400	10488	" " M=1.15 "
12	2.00	23.00	1480	11968	" " M=1.20 "
13	2.00	25.00	1560	13528	" " M=1.25 "
14	1.00	26.00	820	14348	" " M=1.30 "
15	7.00	33.00	450	14798	DECEL. & DESCEND
16	10.00	43.00	2400	17198	APPROACH, LAND & STOP

25 30 35 40 45 50 55 60

TIME ~ MINUTES

SECRET

AVRO AIRCRAFT LIMITED S2193

Inter-Departmental Memorandum

S1905-57/16
AT

Ref 8367/22/J
Date April 22, 1958
To S. E. Harper
From T. Roberts
Subject ARROW 1 - FIRST FLIGHT R.F.T.

Herewith Addendum 9, of R.F.T. 07-5024, giving the test requirements for the nineth flight of the initial series of flights.

T. Roberts
Technical Flight
Test Co-ordinator

TR*bb

c.c.
Messrs J.C. Floyd
J.A. Chamberlin
R.N. Lindley
F.H. Brame
C.S. Marshall
C.V. Lindow
F.P. Mitchell
P. Martin
D. Scard (6)
J. Booth
J. Ames
J. Scott
J. Lynch
J. Gale
G. Hake
D. Rogers
J. Zurakowski
F. Bradshaw

W/C G. Waterman
W/C G. Waterman (2) AVRO T.S.D. RCA F for transmittalto S/L K. Owen C.E.P.E. Detachment.

Central Files

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

SECRET

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 07-5024 Add. 9

SHEET NO. 1 OF

DATE: April 22, 1958

AIRCRAFT 25201	ASSIGNMENT NO.	WORK ORDER NO.

This addendum covers the specific test required on the nineth flight of the initial series of flights, or definitely prior to aircraft being grounded.

1. INSTRUMENTATION

As for flight No. 6.

2. PURPOSE OF TEST

To establish a stabilized max level speed at 48,000 ft. with the existing 39" cylindrical ejector.

3. TEST PROCEDURE

3.1 Climb at 350 kts. IAS to 30,000 ft. with afterburner.

3.2 Accelerate at 30,000 ft. to 450 kts. IAS.

3.3 Climb at 450 kts. IAS to 48,000 ft.

3.4 At 48,000 ft. level out and accelerate to max. level speed or M = 1.7. If M = 1.7 is reached before max level speed is attained climb at M = 1.7 constant up to a maximum of 55,000 ft.

3.5 Reduce speed to M = 0.9 and descend to approx. 25,000 ft, continue to descend to circuit height at 350 kts. IAS.

5. DATA ON PILOT'S VOICE

The following data is required on Pilot's voice in addition to the instrumentation in (1).

Airspeed
Altitude
RPM
JPT
Press Ratio
Fuel Remaining

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

SECRET
UNLIMITED

R.F.T. NO. 5024 Add. 9

SHEET NO. 2 OF 2

DATE: April 22, 1958

AIRCRAFT 25201	ASSIGNMENT NO.	WORK DRDER NO.

The above quantities should be given as frequently as possible during the climb and acceleration to maximum level speed.

R.F.T. PREPARED BY:	APPRDVED BY:	AUTHDRIZED BY:
DATE FDR CDMPLETION	PRIDRITY	ESTIMATED CDMPLETION DATE:

National Research Council Canada
Canada Institute for Scientific end Technical Information
J.H. Parkin Branch

Conseil national de recherches Canada
Institut cenadien de l'information scientifique et technique
Annexe J.H.Parkin

Report No.: QCX Avro CF105 Misc 26

Has been: ☐ Downgraded to: As per letter 1463-(Ac)95/0043

☐ De-Classified

By: (Name) .....

(Dept) .....

Date: JAN 8 96

B.J. Petzinger
Deputy Coordinator
Access to Information and Privacy
Signature